ENGENDERING CYBER-MINDEDNESS IN THE UNITED

STATES AIR FORCE CYBER OFFICER CORPS

BY

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APPROVAL

The undersigned certify that this thesis meets masters-level standards of research, argumentation, and expression.

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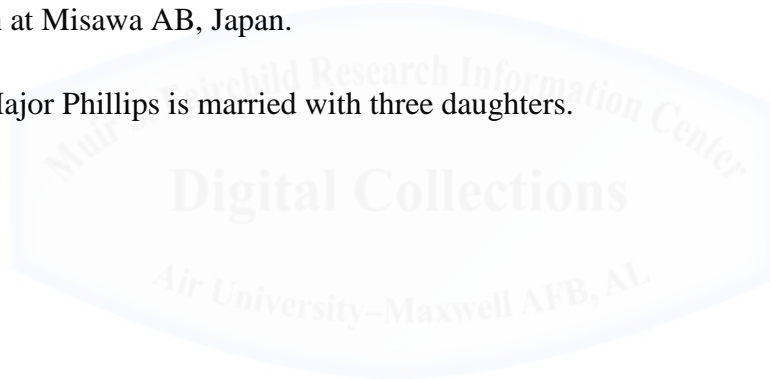
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ABSTRACT

The mission of the United States Air Force is to *fly, fight* and *win*...in air, space and cyberspace. The Air Force is the first military service in the Department of Defense to include the cyberspace operating domain as part of its mission. The Air Force has undergone notable changes to incorporate this new domain of operations, to include establishing a cyberspace numbered air force and creating a cyberspace career field. The Air Force converted all of its Communications and Information Officers into Cyberspace Operations Officers in April 2010. The Air Force, however, has not completed an in-depth analysis of what skills the officers in this new career field will need in order to face future cyberspace challenges. This new career field is an amalgamation of officers with different educational backgrounds and operational experiences.

The essence of any organization is the culture among its members. An accepted definition of organizational culture is a shared set of beliefs among members of a group that establishes acceptable behavior by individuals within the group. When the Air Force recognized cyberspace as an independent operating domain it became important for the service to foster a cyber-minded culture.

This research offers a better understanding of and recommendations for shaping a cohesive, operationally-oriented, and mature cyber-minded culture, which the Air Force desires for its new operating domain. To accomplish this goal, this research explores three context-specific cultural variables with regard to their influence on certain career fields in the Air Force's operating domains. Those variables are advocacy and mentorship, education and formal training, and divergence of career paths. Each of the variables plays a role in fostering cohesion, operational orientation, and maturity of *domain*-minded cultures. A study of the air- and space-minded cultures, with a careful focus on their maturation from their birth and early growth stages to organizational midlife, should yield insights for the organizational culture emerging in the newest operating domain – cyberspace.

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Introduction

If one is serious about protecting the country in these cyber times, these highly vulnerable grid times, I would suggest one simply has no alternative but to get the military involved in this aspect of protecting the country.

James Woolsey, Former CIA Director, Nov 2010

Why Cyber-mindedness?

The mission of the United States Air Force is to *fly, fight* and *win*...in air, space and cyberspace.[1] The Air Force is the first military service in the Department of Defense to include the cyberspace operating domain as part of its mission. A press release dated 8 December 2005 expressed the Air Force's commitment to this operational arena. Then Secretary of the Air Force Michael W. Wynne and Air Force Chief of Staff General T. Michael Moseley wrote a *Letter to Airmen* which included the new mission statement: "The mission of the United States Air Force is to deliver sovereign options for the defense of the United States of America and its global interests -- to fly and fight in Air, Space, and Cyberspace."[2] In the five years since that release, the Air Force has undergone notable changes to incorporate this new domain of operations, to include creating a cyberspace career field and establishing a Numbered Air Force, the Twenty-fourth Air Force, dedicated to cyberspace.

United States military services attribute significant relevance to the cyberspace domain because it is one in which numerous adversaries compete. To appreciate this significance it is important to define cyberspace clearly. As a starting point, the 2006 National Military Strategy for Cyberspace Operations (NMS-CO) defines cyberspace as "a domain characterized by the use of electronics and the electromagnetic spectrum to store, modify, and exchange information via networked systems and physical infrastructures."[3] The NMS-CO establishes a common understanding of cyberspace in a military strategic framework. Daniel T. Kuehl offers a more developed definition that builds on the one provided in the NMS-CO. He defines cyberspace as "a global domain

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[1] The Official Web Site of the U. S. Air Force, http://www.af.mil/main/welcome.asp, (accessed 24 Jan 2011).

[2] Air Force News Statement, 8 December 2005, http://www.af.mil/news/story.asp?storyID=123013440 (accessed 24 Jan 2011)

[3] National Military Strategy for Cyberspace Operations, December 2006, pg. ix.

within the information environment whose distinctive and unique character is framed by the use of electronics and the electromagnetic spectrum to create, store, modify, exchange, and exploit information via interdependent and interconnected networks using information communication technologies."[4] Kuehl's definition adds the functions of creating and exploiting information, which are critical aspects of conducting operations in the cyberspace domain. This enhanced articulation of the cyberspace domain is the foundational definition used in this research to explore the Cyberspace Operations Officer culture.

   The Air Force converted all of its Communications and Information Officers into Cyberspace Operations Officers in April 2010. The Air Force, however, has not completed an in-depth analysis of what skills the officers in this new career field will need in order to face future cyberspace challenges.[5] This new career field is an amalgamation of officers with different educational backgrounds and operational experiences. The career field is divided into A and B shreds. Officers in the 17DXA shred perform operational missions on numerous computer networks. On the other hand, 17DXB officers perform more traditional communications missions or operations to keep the networks running. The Air Force, specifically the office of Chief of Warfighting Integration and Chief Information Officer (SAF/CIO-A6), faces the challenge of fostering a cohesive and operationally-oriented cyber-minded culture in this new career field to enhance its ability to fight and win in cyberspace.

Creating a Culture

   The concept of organizational culture dates back to early sociological studies of the 1940s and 1950s. An accepted definition of organizational culture is a shared set of

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[4] Daniel T. Kuehl. *From Cyberspace to Cyberpower: Defining the Problem* in Kramer, Franklin D., Stuart H. Starr, and Larry K. Wentz (eds.) *Cyberpower and National Security* (Dulles, VA: Potomac Books/Center for Technology and National Security Policy, National Defense University, 2009), 28. - Daniel Kuehl is the director of the Information Strategies Concentration Program (ISCP), a specialized curriculum on the information component of national power offered to students attending the National War College and Industrial College of the Armed Forces. He develops and presents graduate offerings on strategic approaches to Information Warfare & Operations.
[5] SAF/CIO-A6 submitted a research topic to Air University requesting an assessment of core competencies required for operators in the cyberspace domain.

beliefs among members of a group that establishes acceptable behavior by individuals within the group.[6] When the Air Force recognized the three distinct operating domains of air, space, and cyberspace, three unique cultures were also distinguished. The diverse responsibilities to perform effectively in each domain require accepted norms, or a *domain*-minded culture, in order to regulate behavior within each of the groups. Edgar Schein offers the following as his formal definition of culture:

> Culture is defined as a pattern of shared basic assumptions that was learned by a group as it solved its problems of external adaptation and internal integration that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems.[7]

Schein presents three levels of analysis distinguishable by their degree of visibility.[8] These levels of culture provide a useful lens to examine the formation and maturation of air-minded and space-minded cultures and will aid in developing the concept of a cyber-minded culture. Artifacts form Schein's first level of analysis for culture. This level includes the aspects of a group which can be easily observed such as language, products, clothing, rituals, and ceremonies. While these traits of a culture are simple to perceive, it is sometimes difficult to draw meaning from them outside the context of the group. Group members will understand their meaning, but outsiders may have to become part of the group to understand the relevance of the artifacts.[9] In Air Force organizations, artifacts include items such as uniforms, occupational badges, and organizational shields. Some organizations will also form a unique language or way of communicating that assists them in performing their mission; these languages could also be considered artifacts. The next level of analysis for a culture is Espoused Beliefs and Values.[10] These are a set of philosophies and attitudes that become an ingrained part of an organization and contribute to its decision-making process. Articulating their beliefs and values can help groups form an identity, but groups are unlikely to be able to explain all of their

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[6] Robert B. Lawson and Curtis L. Ventriss, "*Organizational Change: The Role of Organizational Culture and Organizational Learning," Psychology Record* 42:2, 205-219 (Spring 1992), 211.

[7] Edgar H. Schein, *Organizational Culture and Leadership* (San Francisco: Jossey-Bass, 2004), 17.

[8] Edgar H. Schein, *Organizational Culture and Leadership*, 25.

[9] Edgar H. Schein, *Organizational Culture and Leadership*, 25-27.

[10] Edgar H. Schein, *Organizational Culture and Leadership*, 25.

shared behavior to outsiders.[11] For example, different groups within the Air Force develop their own doctrine, manuals, and briefings that document the way they do business; these help them form their identity. The final level of analysis that will aid in further explaining behavior in Schein's model involves Basic Underlying Assumptions. These are traits that become so deep-seated in an organization that any deviation from the values associated with the traits is virtually inconceivable. Groups accept these unspoken beliefs so unquestioningly that they find them very difficult to challenge or change.[12] Schein emphasizes the importance of this level of analysis in culture by stating, "The essence of a culture lies in the pattern of basic underlying assumptions, and once one understands those, one can easily understand the other more surface levels and deal appropriately with them."[13]

Schein also argues that an organization's culture evolves through stages ranging from the birth of the organization through organizational maturity. Within each growth stage, Schein identifies the role that culture plays within the organization and mechanisms that would foster cultural change and further maturation. The change mechanisms are cumulative in that if they are present in early stages of an organization's growth, they should remain relevant as the organization matures.[14] The discussion of each operating domain will demonstrate the presence of these general and specific evolution change mechanisms. General evolution is the natural adaptation of the culture due to changes in its external environment or internal structure. Specific evolution is the adaptation of parts of the culture and causes subgroups or subcultures to form, which points toward cultural maturation.[15] Table 1 depicts Schein's Organizational Growth Stages and the change mechanisms associated with each.

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[11] Edgar H. Schein, *Organizational Culture and Leadership*, 28-30.
[12] Edgar H. Schein, *Organizational Culture and Leadership*, 30-35.
[13] Edgar H. Schein, *Organizational Culture and Leadership*, 36.
[14] Edgar H. Schein, *Organizational Culture and Leadership*, 292.
[15] Edgar H. Schein, *Organizational Culture and Leadership*, 276-8.

Growth Stage	Function of Culture	Change Mechanism
Birth and Early Growth	- Source of Identity - Hold organization together - Integration - Socialization/commitment to mission	- General evolution - Specific evolution - Managed evolution
Organizational Midlife	- Oversee subcultures - Crisis of Identity - Opportunity to manage change	- Planned change - Incrementalism - Challenging myths
Organizational Maturity	- Constraint on Innovation - Source of self-esteem	- Coercive persuasion - Reorganization - Organization destruction/rebirth

Table 1: Organizational Growth Stages
Source: Adaptation of Edgar Schein's Growth Stages, Functions of Culture, and Mechanisms of Change from Schein, *Organizational Culture and Leadership, pg.* 292 and Jones, *Breaking Glass Without Getting Cut,* pg. 8.

This research offers a better understanding of and recommendations for shaping a cohesive, operationally-oriented, and mature *domain*-minded culture, which the Air Force desires for its new cyberspace operating domain.[16] Cohesiveness within the culture will become evident as the group creates a sense of identity. Artifacts specific to the group could signal an emerging identity. Those artifacts may include items such as shields or badges that represent the mission of members within the operating domain. The development and use of a common operating language likewise could demonstrate the emerging culture's cohesiveness. Doctrine and other documents that help members of the culture articulate their missions may indicate how operationally oriented the culture is becoming. The *domain*-minded culture's ability to articulate its Espoused Beliefs and Values in those documents help it and the rest of the Air Force understand the domain's growing role for military operations. Finally, as the *domain*-minded culture matures, it should evolve through Schein's organizational growth stages. When the group creates subcultures and demonstrates that it can plan and manage change, it will have reached what Schein calls a 'midlife' level of maturity.[17]

To accomplish the goal of shaping a cohesive, operationally-oriented, and mature cyber-minded culture, this research explores three context-specific cultural variables with

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[16] SAF/CIO-A6 submitted a research topic to Air University requesting an assessment of core competencies required for operators in the cyberspace domain.
[17] Edgar H. Schein, *Organizational Culture and Leadership*, 283.

regard to their influence on certain career fields in the Air Force's operating domains, they are: advocacy and mentorship, educational background and training, and divergent career paths. A study of the air- and space-minded cultures, with a careful focus on their maturation from their birth and early growth stages to midlife, should yield insights for organizational culture emerging in the newest operating domain – cyberspace. Evidence that a *domain*-minded culture is emerging may include several indicators, such as: shared norms among members of the career field, operators within a domain holding key leadership positions, and recognition of the domain as an independent sphere of operational influence. Chapters 1 through 4 of this thesis discuss evidence of these indicators in each of the Air Force's operating domains.

Defining the Existing Cultures and Variables Influencing Them

Schein's organizational culture model provides a lens through which to examine the USAF flying and space career fields and investigate the emergence of air-minded and space-minded cultures in each. Air-mindedness and space-mindedness are the essence of cohesive, operationally-oriented, and mature cultures in these respective domains. Analyzing the cultures among the members of the career fields that are responsible for operating in the air and space domains should inform the USAF's efforts to shape a cyber-minded culture within its new cyber-officer career field. Air-mindedness can be defined as simply as "interested in aviation or air travel."[18] By deduction, space-mindedness would mean interest in space flight or space operations. The problem with these common definitions of *domain*-mindedness is that they do not take into consideration the role each domain has in military operations. In a fall 2009 *Air and Space Power Journal* article, Lt Gen Robert J. Elder Jr., in a discussion of the domain-centric Air Force missions, concluded that it is the responsibility of Airmen to "protect the nation and its global interests by conducting global, regional, and tactical operations through air, space, and cyberspace."[19] Thus, an expanded definition of air-mindedness based on this conclusion may be: the capacity to protect the nation and its global

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[18] *Merriam Webster's Collegiate Dictionary. (*Eleventh Edition: 2008), 27.
[19] Robert J. Elder Jr. *"*Air-Mindedness: Confessions of an Airpower Advocate*," Air and Space Power Journal* (Fall 2009), 18.

interests through understanding and maintaining the ability to conduct global, regional, and tactical operations through the air. Definitions of space- or cyber-mindedness could then be derived by substituting the word 'space' or 'cyber' for the word 'air' in the previous definition.

Schein's model enables an examination of variables common to *domain*-minded career fields that may have contributed to the development of their specific cultures. These variables may also play a role in the culture emerging in the new cyber-officer career field. The variables used to delve into the cultures of each operational domain are advocacy and mentorship, education and training background, and divergent career paths.

Merriam Webster defines advocacy as the act or process of supporting a cause or proposal.[20] Mentor is defined as a trusted counselor or guide.[21] Advocacy and mentorship have played critical roles as cultures emerged in organizations and institutions. Advocacy is crucial during the birth and early growth stages of an organization. As an organization's culture matures, mentors from within tend to exert more influence than the advocates who were fundamental in the beginning. Sharing experiences and learning lessons from mentors is indispensible to developing a common mindset among members. The Air Force should find that advocacy and mentorship can help it foster an emerging cyber-minded culture. The presence of advocacy and mentorship within a culture can range from extreme to nil. In extreme cases, very senior leaders could tout the importance of operations within the domain frequently. On the opposing end of the continuum, leaders could ignore the domain and thus its operational role within the service. This variable can play a factor in the desired outcome by creating cohesiveness among members of a *domain*-minded culture through the proliferation of a consistent message from leaders. This thesis presents the following hypothesis in relation to this variable:

Hypothesis 1: Increased levels of advocacy and mentorship should foster the creation of a cohesive and operationally-oriented *domain*-minded culture.

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[20] *Merriam Webster's Collegiate Dictionary. (*Eleventh Edition: 2008), 19.
[21] *Merriam Webster's Collegiate Dictionary. (*Eleventh Edition: 2008), 776.

Educational background and subsequent training vary within operational career fields and can influence the development and maturation of a *domain*-minded culture. This variable can help to explain diversity between organizations in the development of shared norms and a common operating language. On one end of the continuum, members of an organization with an array of educational experiences may require lengthy subsequent training to achieve any degree of cohesion and a shared operational orientation. On the other end of the scale, organizations with more homogeneous members could share norms and a common language after much shorter introductory training courses. This variety or similarity of undergraduate education accomplished prior to accession into the Air Force, along with the subsequent extent of AF training required to achieve and maintain a level of proficiency in the operating domain, measure the extent of this variable. This variable accounts for the formation of shared norms and, therefore, a higher level of cohesion and operational orientation within the *domain*-minded culture. This thesis presents the following hypothesis in relation to the education and training variable:

Hypothesis 2: Common educational backgrounds or intense formal training of appropriate duration should lead to the creation of a cohesive and operationally-oriented *domain*-minded culture.

Organizations typically have varying degrees of career path divergence. The divergence results in the formation of subcultures. Subcultures indicate a maturing organizational culture. Members of organizations are commonly assigned specific tasks or responsibilities that require them to specialize, or diverge, from other members of the group. For example, an organization may have marketing and accounting departments with diverse responsibilities requiring specialization; subcultures within those specialties may, therefore, emerge. Similarly, officers are assigned to both create effects within an Air Force operating domain and to play supporting, but vital, roles in these domains. Different organizations exhibit different degrees of divergence and create barriers of various levels inhibiting members from changing their paths at some point in their careers. Therefore, this variable is measurable based on degrees of divergence: is there a

substantial difference in the career paths? As organizations manage diverse responsibilities among their members, they can either create barriers between the emerging career paths or foster cross-flow between them. A barrier to cross-flow, like extensive training, may indicate a higher degree of divergence. Alternatively, if fewer barriers are present and changes are more easily accomplished, a lower degree of divergence likely exists. High degrees of divergence may foster increased cohesion and more focused operational orientation, particularly within the subcultures emerging within divergent career paths. However, just because members of a subculture are very cohesive does not necessarily mean that the overall group is less cohesive. Schein recognized that it takes a more mature culture to manage the divergence among its members exhibited by the presence of subcultures.[22] Therefore, any degree of divergence within the organization could also indicate an increased level of maturity for the culture. This thesis presents the following hypothesis in relation to the divergent career path variable:

Hypothesis 3: Lower degrees of divergence and reduced barriers to changing career paths should lead to the creation of a cohesive and operationally-oriented *domain*-minded culture, and the presence and management of subcultures indicates the transition from early growth to midlife.

Summary and Roadmap

This thesis tackles the following question: How can the USAF use its existing air-minded and space-minded cultures as templates to create a cohesive, operationally-oriented, and mature cyber-minded culture and engender cyber-mindedness in the new 17D cyber-officer career field? Cyber-mindedness is defined as: the capacity to protect the nation and its global interests through understanding and maintaining the ability to conduct global, regional, and tactical operations through cyberspace. The Air Force's desire to operate in this domain, and its creation of a cyberspace operations career field, compel the need for research into the formation of a cyber-minded culture. The well-established operational domains provide a relevant context with which to study culture in

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[22] Edgar H. Schein, *Organizational Culture and Leadership*, 283.

a military operating environment. Edgar Schein's organizational culture model offers a useful tool through which to investigate the context-specific variables that may have influenced the development of air-minded and space-minded cultures. The growth stages and levels of analysis presented in Schein's work will prove invaluable in accomplishing this task. The goal of this research is to offer recommendations to the Chief of Warfighting Integration and Chief Information Officer (SAF/CIO-A6) on how to shape a cyber-minded culture and, in turn, engender cyber-mindedness in the new career field and the new operating domain.

Chapter 1 analyzes the existing air-minded culture by examining the evolution of air-mindedness and the emergence of air as a military operating domain. It presents each of the research variables in relation to air-mindedness and evaluates each proposed hypothesis. The chapter concludes with a discussion of the air-minded culture with regard to Schein's levels of analysis, creating an accurate depiction of the culture. Chapter 2 provides a similar analysis of the space-minded culture. Chapter 3 explores the current state of the cyberspace operating domain in the USAF. This chapter also discusses the new 17D career field and the two different shreds that compose it, describes the new Undergraduate Cyberspace Training course, and looks into the cyberspace continuing education program. Chapter 4 reviews each cultural variable, using the air and space domain contrasts and analogies to inform the emerging cyber-minded culture. The final chapter offers a summary of each variable with regard to the cyber-minded culture, recommendations to USAF leaders with an interest in the cyberspace domain on engendering cyber-mindedness, limitations of the current research, and recommendations for future research. A cohesive and operationally-oriented cyber-minded culture should advance the Air Force's ability to conduct global, regional, and tactical operations through the cyberspace domain.

Chapter 1

The Air-Minded Culture

When my brother and I built the first man-carrying flying machine, we thought that we were introducing into the world an invention which would make further wars practically impossible.

Orville Wright, 1917

Evolution of Air-Mindedness

According to Merriam-Webster, the term 'air-minded' was first used in 1924, but the ideas behind the concept may be as old as the quest for manned flight itself. The dictionary defines air-minded as: interested in aviation or air travel.[1] The Wright brothers' steadfast devotion to attaining manned flight coincides perfectly with this basic definition of air-mindedness. The Wrights were interested in the science of aviation for many years before they committed themselves in 1899 to achieving human flight.[2] The brothers enthusiastically studied and learned from previous aeronautical experimenters, and this contributed significantly to their eventual success.[3] The Wright brothers built a series of kites, gliders, and experimental aircraft to further their knowledge in the science of flying. Their toils produced the 1903 Wright Flyer. The culminating moment of the Wright's *oeuvre* was December 17, 1903 at 10:35 A.M. Orville piloted the craft, and the first official manned and powered flight lasted 12 seconds covering a distance of 120 feet.[4] Over the course of the next two years they improved on the 1903 design, resulting in the 1905 Wright Flyer which became known as "the world's first truly practical flying machine." On October 5, 1905, Wilbur flew a distance of 24 ½ miles in 39 minutes in the 1905 Wright Flyer, the first airplane that realized sustained flight.[5] Over the next couple of years, the Wrights secured patents for their airplane invention and approached the War Department to discuss the research and development of a military aircraft. In late 1907 they negotiated a $25,000 contract to deliver a two-passenger plane that could

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[1] *Merriam Webster's Collegiate Dictionary. (*Eleventh Edition: 2008), 27.

[2] Peter L. Jakab, *Visions of a Flying Machine: The Wright Brothers and the Process of Invention* (Washington DC: Smithsonian Institution Press, 1990), 41.

[3] Peter L. Jakab, *Visions of a Flying Machine*, 3.

[4] Peter L. Jakab, *Visions of a Flying Machine*, 210.

[5] Peter L. Jakab, *Visions of a Flying Machine*, 216.

fly at 40 miles per hour for at least 125 miles. On August 2, 1909 the War Department accepted the first US military airplane from the Wright brothers.[6] With this delivery, the basic definition of air-mindedness needed augmenting to consider military air operations.

Giulio Douhet extended the notion of air-mindedness into the military sphere by promoting the use of airplanes in warfare. He grasped the importance of military airpower, and he could be considered one of the first to do so. During his lifetime, the military employment of air assets evolved from balloons, to dirigibles, to fixed-wing aircraft. While many of his contemporaries only considered using the airplane for observation, Dohuet recognized that it could be used directly against surface forces in combat.[7] Douhet argued that, "the form of any war – and it is the form which is of primary interest to men of war – depends upon the technical means of war available."[8] He analyzed the introduction of previous technological advances in warfare, such as firearms, barbed wire, and submarines, to articulate his vision for employing airplanes. Using a deterministic approach to airpower he envisaged the independent strategic use of the airplane. Douhet's seminal writings from the 1920s articulate concepts that continue to influence the air-minded culture to this day.

Three concepts in particular continue to shape our understanding of air-mindedness. Giulio Douhet first compelled airmen to grasp *command of the air*, which he defined as "being in a position to prevent the enemy from flying while retaining the ability to fly oneself."[9] This idea maintained its importance to military aviators and matured into what is now considered air supremacy. The North Atlantic Treaty Organization defined air supremacy in 1973 as: "that degree of air superiority wherein the opposing air force is incapable of effective interference."[10] Attaining and maintaining air supremacy is at the forefront of wartime mission planning and plays a significant role in the air-minded culture. Secondly, Douhet believed in the efficacy of strategic

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[6] Alfred F. Hurley and William C. Heimdahl, "The Roots of U.S. Military Aviation," In *Winged Shield, Winged Sword: A History of the United States Air Force, Volume One*, edited by Bernard Nalty (Washington, D.C.: Air Force History and Museums Program 1997), 13-14.
[7] Giulio Douhet, *The Command of the Air,* Introduction by Joseph Patrick Harahan & Richard H. Kohn (Tuscaloosa, Alabama.: University of Alabama Press, 2009), 3.
[8] Giulio Douhet, *The Command of the Air*, 6.
[9] Giulio Douhet, *The Command of the Air*, 24.
[10] NATO GLOSSARY OF TERMS AND DEFINITIONS. Document AAP-6(2010). Released 23 March 2010, pg. 2-A-11.

bombing. Douhet maintained that a nation should be "resigned to the damage the enemy may inflict upon us, while utilizing every means at our disposal to inflict even heavier damage upon him."[11] He believed that massive destruction targeted at enemy civilians would facilitate prompt enemy capitulation and that air forces should inflict that damage on the enemy as quickly and dramatically as possible.[12] Airpower leaders continue to argue over the effectiveness of strategic bombing in wars past, present, and future. This debate demonstrates the influence that the concept of strategic bombing has had on the air-minded culture. Finally, Douhet contended that air forces need to be independent of surface forces. That contention has inspired the way militaries have organized ever since. Douhet asserted that "national defense can be assured only by an independent air force of adequate power," and that "an air force functioning completely independent of the army and navy is of paramount importance."[13] Douhet's three seminal concepts shaped the communal beliefs held by US Army Air Corps leaders. General William "Billy" Mitchell's assertion that waiting for the enemy to attack from the air was ceding defeat and General Henry "Hap" Arnold's belief that that Air Force should be offensive both exhibit the influence of Douhet.[14] These shared norms were critical to the Army Air Corps' pursuit of autonomy and informed the creation of the United States Air Force as a separate service in 1947. Achieving independence empowered the emerging air-minded culture within the new service.

With the help of early airpower enthusiasts such as the Wright brothers and Giulio Douhet, the concept of air-mindedness progressed from a purely civilian notion to one that included the military application of airpower, and an air-minded culture emerged within the military. What started as a basic interest in aviation matured into the capacity to protect the nation and its global interests through understanding and maintaining the ability to conduct global, regional, and tactical operations through the air domain. Consider now how advocacy and mentorship, education and training, and divergent career paths all helped shape an air-minded culture in the United States Air Force.

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[11] Giulio Douhet, *The Command of the Air*, 59.
[12] Giulio Douhet, *The Command of the Air*, 61.
[13] Giulio Douhet, *The Command of the Air*, 32-33.
[14] Richard J. Overy, *The Air War 1939-1945* (Dulles, VA: Potomac Books, Inc., 2005), 16.

Advocacy and Mentorship

      Advocacy and mentorship help develop and shape cohesive and operationally oriented *domain*-minded cultures. Advocacy by Army Air Service and subsequently Army Air Corps leaders was essential to the creation of the USAF as a new military service. Without the advocacy, commitment, and determination of early airpower leaders such as William "Billy" Mitchell, the United States may not have had an independent Air Force as early as 1947. World War I combat exposed him first-hand to the horrors of war, and he sought to avoid such carnage in future combat. He envisioned a more prominent role for airpower, one which would reduce the attrition of land armies over stalemated battle lines and possibly eliminate land forces all together.[15] Mitchell's argument for a separate service asserted, "The time has come when aviation must be developed for aviation's sake and not as an auxiliary to other existing branches."[16] His arguments alone were not convincing, so Mitchell demonstrated the potential of military aviation to skeptics. Only by convincing Congress of the dominant role that an air force could have over surface forces would they pass a law establishing a separate service.

      Mitchell's mentorship was critical as he developed air power doctrine and conducted bombing experiments with other aviators to support his airpower claims. In 1919, he led a team of men returning from the war in Europe. Mitchell's team addressed issues such as airpower organization, personnel requirements, and establishing continental airways.[17] In the fall of 1920 he testified to Congress that by using airplanes his group could destroy any battleship.[18] Mitchell and his crew bombed ships and submarines off the Virginia coast to back up his testimony. Demonstrating his mentorship, Mitchell accompanied every bombing mission during the tests in his control ship, the *Osprey*.[19] From the *Osprey's* perch, he would signal to the bomb crews what he wanted them to do during the tests.[20] Senior leaders forced them to play by the Navy's rules, but the tests ultimately demonstrated Mitchell's claims. The sinking of the German

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[15] William Mitchell, *Winged Defense: the Development and Possibilities of Modern Air Power--economic and Military* (Tuscaloosa, AL: University of Alabama, 2009), 18.
[16] William Mitchell, *Winged Defense*, x.
[17] William Mitchell, *Winged Defense*, 30-32.
[18] William Mitchell, *Winged Defense*, 41.
[19] William Mitchell, *Winged Defense*, 60.
[20] William Mitchell, *Winged Defense*, 60.

battleship *Ostfriesland* on 22 July 1921 highlighted airpower's capability against naval vessels.[21]

Mitchell could not convince Congress to create an independent air force, despite the success of these demonstrations and mounting public support. Unfortunately, his continued attacks on the Navy and Army air divisions led to his court martial in September 1925 and ultimately his resignation on 1 February 1926.[22] He continued advocating for airpower after his resignation, but he did not live to see the fruits of his labor. Yet his impact endured due to the impression he made on young Air Corps officers. Hap Arnold, Carl Spaatz, Robert Olds and Ira Eaker are but a few Mitchell supporters who went on to become future Air Corps leaders, airpower theorists, and advocates of an independent air force.[23] Mitchell's advocacy and mentorship contributed significantly to an emerging cohesive and operationally-oriented air-minded culture within the Army. He brought aviators together, developed tactics, techniques, and procedures, and he demonstrated how airpower could defend American coasts.

The United States went into World War II without an independent air force, but airpower and the Army Air Forces performed a vital role throughout the war. Commanding General of the Army Air Forces, General Henry "Hap" Arnold, who Billy Mitchell strongly influenced, emerged as the main advocate for an independent service.[24] General Arnold envisioned "three autonomous services, each of which would have an equal and direct share of the total responsibility."[25] In January 1946, Arnold passed his leadership responsibilities to General Carl A. Spaatz. Spaatz continued the fight for a new service and organized the Army Air Forces into three major commands easily incorporated into the organizational structure of an independent air force.[26] Finally, after nearly 30 years of advocacy by air power leaders, President Truman signed the National

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[21] Alfred F. Hurley, *Billy Mitchell: Crusader for Air Power* (New York: F. Watts, 1964), 67.

[22] Mark A. Clodfelter, "Molding Airpower Convictions: Development and Legacy of William Mitchell's Strategic Thought," In *The Paths of Heaven: The Evolution of Air Power Theory*, edited by Phillip Meilinger (Maxwell Air Force Base, AL: Air University Press, 2001), 103-104.

[23] Mark A. Clodfelter, "Molding Airpower Convictions, 107.

[24] Herman S. Wolk, "The Quest for Independence," In *Winged Shield, Winged Sword: A History of the United States Air Force, Volume One*, edited by Bernard Nalty (Washington, D.C.: Air Force History and Museums Program 1997), 372

[25] Herman S. Wolk, "The Quest for Independence," 372.

[26] Herman S. Wolk, "The Quest for Independence," 375.

Security Act of 1947 establishing three autonomous military services: the Army, Navy, and Air Force.[27] Creating an independent service responsible for military operations in the air domain served as the strongest possible signal that the nation recognized that a cohesive and operationally-oriented air-minded culture had emerged within its military. The advocacy and mentorship of numerous Air Force leaders underwrote the enormous effort required to achieve that independence.

Generals Mitchell, Arnold, and Spaatz influenced many aviators. They held positions that enabled them to promote the national security benefits of airpower and the establishment of an independent Air Force. As they developed airpower theory and doctrine they also filled the role of mentor to the next generation of officers. Advocacy and mentorship were critical in the development of an air-minded culture in the United States Air Force. Mitchell's leadership of the team which conducted bombing tests off the coast of Virginia is an example that he fostered a cohesive and operationally-oriented air-minded culture among operators in the air domain.

Education and Training of Aviators

Shared norms developed through education and training experiences contribute to cohesive and operationally-oriented *domain*-minded cultures. Common backgrounds help members of a group define its culture; similar education or training experiences can provide commonality for new or emerging groups. Schein considers it critical for groups to create a common language as it is part of the internal integration process for members of the group to understand each other.[28] Groups created with members that have similar educational experiences may already have such a common language at the birth of the organization. Groups with dissimilar members may take longer to develop and reach a point where they understand one another. USAF pilots generally have disparate educational backgrounds, for example, but during the long, intense Undergraduate Pilot Training program they develop the common skill set and mindset required in an air-minded culture.

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[27] Herman S. Wolk, "The Quest for Independence," 395.

[28] Edgar H. Schein, *Organizational Culture and Leadership* (San Francisco: Jossey-Bass, 2004), 112.

The Air Force carefully establishes common requirements or qualifications for each of its career fields. The Air Force Officer Classification Directory (AFOCD) details requirements for accession into each Air Force specialty. Each unique specialty is branded with an Air Force Specialty Code (AFSC). The AFSC 11XX is the Pilot Utilization Field and encompasses all flying functions performed by pilots to include combat, combat support, and training missions.[29] The AFOCD categorizes all Air Force pilots into one of the following AFSCs: 11B (Bomber), 11E (Experimental Test), 11F (Fighter), 11G (Generalist), 11H (Helicopter), 11K (Trainer), 11M (Mobility), 11R (Reconnaissance/Surveillance/Electronic Warfare), 11S (Special Operations), and 11U (Unmanned). For each pilot AFSC there are specific qualifications listed in the fields of knowledge, education, training, and experience. The Air Force desires that all its pilots, except the 11E, have undergraduate degrees in physical sciences, mathematics, administration, or management.[30] The service requires its experimental test pilots, which make up less than 1% of the pilot career field, to have technical degrees in physical sciences, mathematics, or engineering.[31] Educational qualifications for pilots are varied, as demonstrated by the desires and requirements listed in the AFOCD. As a result of these entrance requirements, Air Force pilots have diverse educational backgrounds. Data from the Air Force Personnel Center confirms the assertion of diversity in the educational background of pilots. Between 1 January 2006 and 29 July 2009, the pilot AFSC was awarded to 2,157 officers. Those officers had earned undergraduate degrees in 185 different educational specialties.[32]

The Air Force has successfully molded individuals from such diverse educational backgrounds into effective pilots and incorporated them into its air-minded culture. The service does so through the lengthy and intense formal training which includes academics, flying training, simulator training, and physiological and physical conditioning.[33] According to the AFOCD, all candidates must complete Air Force Specialized Undergraduate Pilot Training (SUPT) to become pilots. SUPT lasts 54

[29] Air Force Officer Classification Directory (AFOCD): The Official Guide to the Air Force Officer Classification Codes. OPR: HQ AFPC/DPSIDC. 31 January 2010, pg. 23.
[30] Air Force Officer Classification Directory (AFOCD): 31 January 2010, pgs. 23-35.
[31] Air Force Officer Classification Directory (AFOCD): 31 January 2010, pg. 25.
[32] Data provided by Air Force Personnel Center.
[33] Specialized Undergraduate Pilot Training website. http://www.baseops.net/militarypilot/ (accessed 3 February 2011).

weeks and is divided into three phases: academics and pre-flight training (8 weeks), primary aircraft training in T-6 or T-34 aircraft (22 weeks), and advanced aircraft training in T-38, T-1, C-12, T-44, or UH-1 aircraft (22-24 weeks).[34] After graduating from SUPT, pilots must complete transition and operational training in their assigned weapon system at various Formal Training Units around the country.[35] The combination of SUPT and training on a specific aircraft can take as long as two years to complete, depending on which platform the new pilot is assigned. Such long and rigorous training inculcates pilots in the language common to the air-minded culture and their specific weapon system's subculture.

Divergent Aviation Career Paths – CAF vs. MAF

Highly divergent career paths and the presence of barriers to switching career paths increase cohesiveness and focus operational-orientation in the resultant subcultures, and they contribute to shaping an overall *domain*-minded culture. Well-defined and managed subcultures may indicate the culture's transition from Schein's early growth stage to organizational midlife. Since the birth of the US Air Force in 1947, aviators perform two distinct missions...combat and mobility. Combat aviators fly missions that gain air superiority and employ kinetic weapons against the enemy and include fighter, bomber, and special operations pilots. Mobility aviators primarily move troops and supplies into and throughout the combat zone and perform support roles, such as refueling and intelligence, surveillance, and reconnaissance. The 1947 USAF *Statistical Digest* listed the divisions of the newly-independent service. The list started off with what Brian Collins described as the service's raison d'être – air combat units. The remaining six functions were listed as supporting roles to combat aviation.[36] The aviators were divided into three specialties. Bomber pilots focused on long-range strategic bombing. Fighter pilots learned to escort bombers, conducted air-to-air and air-to-ground operations against the enemy, and partook in tactical reconnaissance missions. Both

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[34] Specialized Undergraduate Pilot Training website. http://www.baseops.net/militarypilot/ (accessed 3 February 2011).

[35] Specialized Undergraduate Pilot Training website. http://www.baseops.net/militarypilot/ (accessed 3 February 2011).

[36] Brian J. Collins, *Behind the Cyberspace Veil: the Hidden Evolution of the Air Force Officer Corps* (Westport, CT: Praeger Security International, 2008), 62-63.

bomber and fighter pilots were considered part of air combat units. Finally, transport pilots moved ground troops and equipment, performed weather reconnaissance, and dropped troops for airborne assaults.

The Air Force articulated the mission of the Military Air Transport Service as support to the combat forces.[37] This distinction between combat aviators and mobility aviators generates what Edgar Schein would identify as occupational reference groups. They are subcultures within an organization that perform a specific task for the organization, such as combat missions or mobility missions. The subcultures will develop their own traits, and leaders within the subcultures will eventually emerge.[38] The distinction between types of aviators occurs very early in a pilot's career. As part of the USAF Specialized Undergraduate Pilot Training program, potential pilots are vectored to either a fighter/bomber or airlift/tanker track. Student preference, student rank order among classmates, and instructor recommendations contribute to the assigned track. Once students are allocated to a specific track, they will continue their training by learning skills specific to the type of platform they will be flying.[39] Finally, the demarcation between combat and mobility aviation is evident in the organization of USAF MAJCOMs. Air combat units are assigned to Air Combat Command (ACC) and Air Force Global Strike Command (AFGSC), while mobility units are assigned to Air Mobility Command (AMC). The mission and history of these MAJCOMs sheds light on the divergent career paths of USAF aviators.

Air Combat Command and Air Force Global Strike Command comprise the USAF's combat air forces (CAF). ACC was established on 1 June 1992 when the strategic and tactical roles and missions of Strategic Air Command and Tactical Air Command were integrated into one organization, ACC.   The mission of Air Combat Command is to be "the primary force provider of combat airpower to America's war fighting commands."[40] In performing its mission, ACC operates fighters, bombers,

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[37] Brian J. Collins, *Behind the Cyberspace Veil*, 63.
[38] Edgar H. Schein, *Organizational Culture and Leadership*, 274.
[39] Specialized Undergraduate Pilot Training website. http://www.baseops.net/militarypilot/ (accessed 3 Feb 2011)
[40] Air Combat Command public webpage. http://www.acc.af.mil/main/welcome.asp (accessed 3 February 2011)

tactical reconnaissance, battle-management, and electronic-combat aircraft.[41] AFGSC was established on 7 August 2009, and its initial forces consisted of nuclear bomber and intercontinental ballistic missile assets transferred from ACC and Air Force Space Command (AFSPC). The mission of AFGSC is to "develop and provide combat-ready forces for nuclear deterrence and global strike operations -- safe, secure, effective -- to support the President of the United States and Combatant Commanders."[42] AFGSC is responsible for operating long-range bomber aircraft, including the B-52 and B-2 bombers.[43] In essence, the primary role of AFGSC is oversight of strategic nuclear forces. The vast majority of air combat assets are found within these two major commands. The pilots trained and assigned to operate the combat weapons systems in these MAJCOMs are part of the CAF subculture. They learn different skills and perform different types of missions than their mobility counterparts.

The mobility air forces, or MAF, are assigned to Air Mobility Command. AMC, coincidentally, was also established on 1 June 1992, the same day as ACC. AMC provides Global Reach, with a stated mission to "provide global air mobility ... right effects, right place, right time."[44] Aviators assigned to AMC operate numerous cargo and tanker aircraft and provide fuel, supplies, and aeromedical support to troops on the frontline of the Global War on Terrorism. In addition to moving people and supplies in combat, mobility forces play a significant role in humanitarian missions. They have historically provided supplies to hurricane, flood, and earthquake victims at home and around the globe.[45] The Berlin Airlift is perhaps the greatest demonstration in history of the strategic impact of mobility air forces. In an effort to save the citizens of the city, the airlift delivered over 2.3 million tons of supplies to Berlin. The Berlin Airlift officially began on 26 June 1948; and, over the course of the next 15 months, the United States and

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[41] Air Combat Command public webpage. http://www.acc.af.mil/main/welcome.asp (accessed 3 February 2011)

[42] Air Force Global Strike Command public webpage. http://www.afgsc.af.mil/main/welcome.asp (accessed 3 February 2011)

[43] Air Force Global Strike Command public webpage. http://www.afgsc.af.mil/main/welcome.asp (accessed 3 February 2011)

[44] Air Mobility Command public webpage. http://www.amc.af.mil/library/factsheets/factsheet.asp?id=229 (accessed 8 February 2011)

[45] Air Mobility Command public webpage. http://www.amc.af.mil/library/factsheets/factsheet.asp?id=229 (accessed 8 February 2011)

Britain achieved their national policy objective of breaking the Berlin blockade. [46] This mission was an example of the unique skills required by mobility aviators that differentiate them from combat pilots and demonstrates the operational effectiveness of the MAF subculture.

All pilots learn general aviation skills, but the Air Force requires specialization that compels a divergence of training, experience, and skills among its aviators. Fighter and bomber pilots learn specific skills such as dog-fighting or dropping bombs, while mobility pilots may learn how to drop cargo or refuel other aircraft. The divergence of aviation career paths leads to subcultures which are part of the overall air-minded culture that permeates all operators in the air domain. Cohesiveness and operational orientation may be tighter and more focused within individual subcultures, but they are still present in the larger air-minded culture. The discrete subcultures, and the ability of organizations to manage those subcultures, also signify a transition to what Schein calls "organizational midlife."[47]

Schein's Levels of Analysis and the Air-minded Culture

This chapter's discussion of these three variables associated with cultural development demonstrates how each contributes to fostering a cohesive and operationally-oriented air-minded culture within the USAF pilot career field. The presence of subcultures also indicates a degree of maturity within the culture. This section looks at the air-minded culture with regard to Schein's organizational levels of analysis. The first level of analysis examined is Artifacts, which are items that represent the culture and are easily observed. For the air-minded culture these would include objects such as organizational shields. From the squadron level up through the entire hierarchy of the service, organizational shields represent Air Force organizations and set them apart from each other. Figure 1 below contains the aviation cultures' organizational shields for the MAJCOM level in the USAF. While each shield is unique in its design, all of these shields share one common feature: a set of wings to represent the concept of flight that is central to the air-minded culture. The uniforms or flight suits worn by pilots,

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[46] Roger G. Miller, *To Save a City: the Berlin Airlift, 1948-1949* (College Station, TX: Texas A&M UP, 2000), 39 & 186.

[47] Edgar H. Schein, *Organizational Culture and Leadership,* 270-271.

the wings worn on their uniforms, and even the aircraft that they fly characterize this air-minded culture and symbolize air-mindedness. The aircraft they fly further distinguishes the CAF and MAF subcultures. CAF aircraft are generally sleek and fast, weapons hang from them, or bomb doors permit the release of weapons. MAF aircraft, on the other hand, are generally bigger, slower, and have large portals used to load pallets or release troops in air drops since they move people and cargo.

Figure 1: MAJCOM Organizational Shields
Source: Air Combat Command, Air Force Global Strike Command, and Air Mobility Command public websites

Organizations document their Espoused Beliefs and Values, the next level of analysis, and ingrain them in their members. Within the air-minded culture the qualifications outlined in the AFOCD that dictate the requirements to become a pilot, or the Tactics, Training and Procedure manuals that detail how to accomplish different aspects of their mission reflect its espoused beliefs. General aviation procedures are an example of an Espoused Belief and Value commonly instilled during SUPT to the entire air-minded culture. Aircraft specific training manuals delineate beliefs and values important to the CAF and MAF subcultures. For example, F-16 pilots in the CAF subculture must learn how to eject from their aircraft. On the other hand, C-130 pilots need to learn the art of balancing cargo to operate in the MAF subculture. This level of analysis includes any part of the culture recorded and embraced by its members.[48]

Schein asserts that Basic Underlying Assumptions form the essence of a culture.[49] All Air Force specialties should share similar Basic Underlying Assumptions, or values that are so deep-seated that they are difficult to challenge, and each specialty may contain some that are unique to their culture. Every member of the Air Force takes an oath to

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[48] Edgar H. Schein, *Organizational Culture and Leadership,* 25.
[49] Edgar H. Schein, *Organizational Culture and Leadership,* 27.

abide by the service's core values. Integrity first, service before self, and excellence in all we do are the three values that are not challengeable. All members of the Air Force must commit to living by these values regardless of rank or career field. Airmen consent to these values unquestioningly; therefore, the values become the Basic Underlying Assumptions for the service as a whole. They pervade the subcultures that emerge from the different operational career fields, including the air-minded culture. Air Force pilots, furthermore, share deep-seated values about the military role of airpower and their particular subculture. These individuals are unlikely to challenge the belief that global, regional, and tactical operations through the air can protect the nation and its global interests. They are also committed to understanding and maintaining these national capabilities. These Basic Underlying Assumptions, unique to the air-minded culture, set it apart from other *domain*-minded cultures.

Conclusion

  This chapter evaluated the culture that has materialized among the USAF pilot career field in the air domain. Advocacy and mentorship, education and training, and career path divergence each had a role in shaping this cohesive and operationally-oriented air-minded culture. The next chapter similarly examines the space-minded culture within the USAF space and missile career field. The study of the USAF's air-minded and space-minded cultures can inform the plans being forged for the new cyberspace operations officer career field. Investigating these previously established *domain*-minded cultures should help the Air Force foster a cohesive and operationally-oriented cyber-minded culture among members of this new career field.

Chapter 2

The Space-Minded Culture

The emergence of this new world poses a vital issue: will outer space be preserved for peaceful use and developed for the benefit of all mankind? Or will it become another focus for the arms race and thus an area of dangerous and sterile competition? The choice is urgent. And it is ours to make.

President Dwight D. Eisenhower

Evolution of Space-Mindedness

The dictionary does not offer a definition of space-minded like it does for air-minded. This may be due to the fact that it is a newer and less familiar operating domain than the air. One Air Force space officer, Major Scott Beidleman, asserts in his research that, "space-mindedness is a mental cultural framework, an understanding that space, space operations, and space capabilities are unique and different from air."[1] He proceeds to compare space-mindedness to Billy Mitchell's concept of air-mindedness. From this comparison, he concludes that "people with space-mindedness understand the space medium and can visualize its potential."[2] Beidleman conducted his research nearly 50 years after man first began to exploit space, illustrating that defining operations for any new domain is difficult until man gains experience functioning within it. As the space domain became a venue for conducting international relations, and eventually military operations, the concept of space-mindedness emerged. A brief review of the history of space operations, particularly military ones, should demonstrate how critical space has become as a military operating environment.

Immediately following World War II, Americans seemed intent on building a flourishing space program; shortly thereafter, the promise dwindled as a result of massive budget cuts and program cancellations.[3] These reductions and a lack of clearly-defined goals with regard to space inform why the Soviet Union orbited the first satellite instead

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[1] Maj. Scott W. Beidleman, *Air Force Space Education: Transforming For Joint Operations*, Research Report no. AU/ACSC/03-1253E/2003-04 (Maxwell AFB, Alabama: Air Command and Staff College, April 2003), 4.

[2] Maj. Scott W. Beidleman *Air Force Space Education: Transforming For Joint Operations,* 4.

[3] Walter McDougall, *…the Heavens and the Earth: A Political History of the Space Age* (New York: Basic Books, 1985), 99.

of the Americans. The launch of Sputnik on 4 October 1957 sparked a race between the United States and the Union of Soviet Socialist Republics; that race clearly established the space domain's utility and role supporting the military, diplomatic, informational, and economic instruments of national power. For years leading up to this achievement, scientists in numerous countries developed the rocketry needed to launch the earliest satellites. Each of the US military services recognized the space domain's potential and fought to justify different space and missile programs, despite US fiscal constraints. The Army and the Navy focused on the Orbiter and Vanguard missile projects, respectively.[4] However, the newly-formed US Air Force knew its role: "it must somehow demonstrate a military mission for satellites."[5]

Air Force leaders, including Secretary of the Air Force James H. Douglas, wanted to develop a national military space program that the new service could lead.[6] On 1 October 1958, President Eisenhower signed the 1958 Space Act. Of particular note, this act declared that the United States would explore space for "peaceful purposes for the benefit of all mankind" and established the National Aeronautics and Space Administration (NASA).[7] Despite the Space Act's non-militaristic character, the Air Force continued to campaign for a lead role in military space programs. It promoted the use of satellites, justifying its military space programs as supporting the peaceful purposes outlined in the 1958 Space Act. As part of its argument the service introduced the term 'aerospace' to encompass both the air and space domains.[8] Air Force leaders, such as Chief of Staff Thomas D. White, proclaimed that space was merely an extension of the air domain that Air Force pilots already operated in.[9] The Army and Navy challenged Air Force plans to lead the military space program, but the Air Force fended off these confrontations and continued its self-promotion with the incoming Kennedy administration in late 1960. Upon taking office, President Kennedy appointed the Wiesner Committee to assess the nation's space program. The Wiesner Committee's

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[4] David N. Spires, *Beyond Horizons: A Half Century of Air Force Space Leadership* (Washington DC: Air University Press, 1998), 53.
[5] Walter McDougall, *…the Heavens and the Earth,* 107.
[6] David N. Spires, *Beyond Horizons: A Half Century of Air Force Space Leadership,* 53.
[7] Michael. Sheehan, *The International Politics of Space* (London: Routledge, 2007), 42-43.
[8] David N. Spires, *Beyond Horizons: A Half Century of Air Force Space Leadership,* 68.
[9] David N. Spires, *Beyond Horizons: A Half Century of Air Force Space Leadership,* 68.

Report criticized the distribution of the military space mission across all of the services and the program's subsequent lack of focus. In response to the report, President Kennedy and Secretary of Defense Robert McNamara assigned primary responsibility for military space to the Air Force.[10]

The Air Force struggled to define the military use of space in the years after it gained responsibility for this vital national mission. Space weaponization was, and remains, a much-debated and controversial topic. The 1967 Outer Space Treaty banned the placement of weapons of mass destruction in space and forbade the deployment of conventional weapons to other celestial bodies. As a result, the military space program focused on using satellites for reconnaissance, communications, meteorological, and navigation missions.[11] The Air Force partnered with NASA, and in 1971 the two agreed that "NASA responsibilities would continue to encompass design, development, and fabrication with the Air Force serving as Department of Defense agent responsible for military requirements."[12] In this post-Apollo era, NASA won approval for the Space Shuttle program, which would become the "work-horse for the whole space effort."[13] The civil-military partnership between the Air Force and NASA laid the groundwork for moving forward and organizing for space operations.

To facilitate its future success as the lead service for military space, the Air Force had to organize effectively. As a first step in this effort, the service had to include the space mission in basic Air Force doctrine. The USAF first did so in 1971 when it identified two primary service responsibilities in its "Role of the Air Force in Space:" promoting space for peaceful purposes and ensuring no other nations gain a strategic advantage in space.[14] The 1979 revision to this doctrine listed three responsibilities: "to protect American use of space, to enhance the performance of land, sea and air forces, and to protect the United States from threats in and from space."[15] Air Force leaders, like Lieutenant General Jerome O'Malley, continued to push for consolidation of the military space mission; effective 1 September 1982 the USAF established Space Command as a

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[10] David N. Spires, *Beyond Horizons: A Half Century of Air Force Space Leadership,* 89.
[11] Michael. Sheehan, *The International Politics of Space,* 93.
[12] David N. Spires, *Beyond Horizons: A Half Century of Air Force Space Leadership,* 182.
[13] David N. Spires, *Beyond Horizons: A Half Century of Air Force Space Leadership,* 182.
[14] AFM 1-1, *United States Air Force Basic* Doctrine (1971), 2-4.
[15] AFM 1-1, *United States Air Force Basic Doctrine,* (1979), 2-8.

new major command.[16] The command's original mission was to operate and maintain early warning radar systems and space-tracking systems. In 1985 the service changed the command's name to Air Force Space Command (AFSPC) to distinguish it from a joint command of the same name.

Prior to, and for sometime after, the establishment of Air Force Space Command, Air Force Systems Command conducted space research and development efforts and was responsible for the launch mission. In 1990 AFSPC doubled in size when it acquired the space launch mission from Air Force Systems Command.[17] AF Space Command, along with other military and intelligence organizations, demonstrated the true operational effectiveness of the space domain during military operations in Southwest Asia in the early 1990s. "Military analysts concluded that in Desert Storm space systems contributed to victory in the political battle, ensured effective command and control, and helped make the war a short conflict, which saved lives."[18] In the 21st century US and coalition forces continued to rely on space-based systems for communications, navigation, weather, intelligence, surveillance, and reconnaissance during operations such as ENDURING FREEDOM and IRAQI FREEDOM.[19]

Until 1992, missileers worked in Strategic Air Command (SAC). "SAC was the operational establishment in charge of America's land-based strategic bomber aircraft and land-based intercontinental ballistic missile (ICBM) strategic nuclear arsenal from 1946 to 1992."[20] Air Force Space Command assumed responsibility of the ICBM mission and the missile officers shortly after SAC stood down in 1992. In 1994, the Air Force merged the separate space and missile career fields, creating the space and missile operations (13S) career field.[21] In 2009, the Air Force moved the 20th AF, its ICBM wings, and

[16] David N. Spires, *Beyond Horizons: A Half Century of Air Force Space Leadership,* 176.

[17] Air Force Space Command 1980s – 1990s Heritage website, http://www.afspc.af.mil/heritage/1980s-1990s.asp (accessed 6 March 2011).

[18] David N. Spires, *Beyond Horizons: A Half Century of Air Force Space Leadership,* 259-260.

[19] Air Force Space Command 2000-2007 Heritage website, http://www.afspc.af.mil/heritage/2000-2007.asp (accessed 6 March 2011).

[20] Wikipedia, Strategic Air Command page, http://en.wikipedia.org/wiki/Strategic_Air_Command (accessed 18 May 2011).

[21] Georges Vernez, Craig Moore, Steven Martino, and Jeffrey Yuen, *Improving the Development and Utilization of Air Force Space and Missile Officers* (Santa Monica, CA: RAND Corporation, 2006), xvii.

missileers out of AFSPC to Air Force Global Strike Command.[22] However, AFSPC retained functional responsibility for the 13S career field, which remains a mix of space and missile operations officers. Today, AFSPC consists of more than 46,000 people and two numbered air forces. Its mission is to "provide an integrated constellation of space and cyberspace capabilities at the speed of need."[23]

  As the lead MAJCOM for Air Force space operations, AFSPC sought to develop a space-minded culture for its space and missile operations officers. The remainder of this chapter examines the research variables and how each contributed to the development of such a culture. Advocacy and mentorship, education and training, and divergent career paths all helped shape a cohesive and operationally-oriented space-minded culture. Exploring these contributions adds to a better understanding of how the Air Force has fostered *domain*-minded cultures and how USAF cyber operators can engender cyber-mindedness for the new career field.

Advocacy and Mentorship

  Advocacy and mentorship help develop and shape cohesive and operationally-oriented *domain*-minded cultures. Advocates and mentors helped the space domain prove itself as a necessary and vital domain for conducting military operations. These roles continue to be necessary as the United States leads in the international space arena. This section looks at two critical phases of advocacy and mentorship beginning with the start of the American space program and followed by when the USAF garnered the lead role in military space.

  By influencing the direction of the space program, numerous individuals played the role of advocate, including: President Dwight D. Eisenhower, President John F. Kennedy, and NASA Administrator James E. Webb. Their advocacy set the framework for national space-mindedness. This led to the buildup of national industry and infrastructure that would support both civilian and military space efforts. President Eisenhower was in office for the launch of Sputnik by the Soviet Union on 4 October

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[22] Air Force Global Strike Command public webpage, http://www.afgsc.af.mil/main/welcome.asp (accessed 3 February 2011).

[23] Air Force Space Command Main Heritage website, http://www.afspc.af.mil/heritage/index.asp (accessed 6 March 2011).

1957 – perhaps the most critical moment in space history. Fellow politicians and American citizens created an uproar following the launch.[24] Their outrage created a sense of urgency for Ike to set US space policy strategically at the opening of the space age. Eisenhower did not support competition in the space domain; thus, he was more than willing to preserve this new domain for peaceful purposes, as declared in the 1958 Space Act.[25] Historians claim that Ike considered racing to the moon a monumental waste of money, as demonstrated by his approval of a reconnaissance satellite program over manned space flight. This choice revealed his peaceful intentions to use space to achieve national security objectives.[26] In the final years of his presidency, therefore, Eisenhower established the foundation for a national space-minded culture, and eventually a military one. His demanding and critical standards forced USAF leaders to take a cohesive and operationally-oriented approach to military space programs.

President Kennedy, when elected in 1960, brought a different outlook with regard to the space race; unlike Eisenhower, he soon called for a massive space build-up.[27] In a report to Congress, he declared that "space competence is as essential for national security as it is for national growth."[28] After just four months in office, Kennedy addressed Congress and the nation asking for a commitment to send men to the moon and bring them back safely by the end of the decade. The President asserted that no space project in this time period would be "more impressive to mankind or more important for the long-range exploration of space."[29] These historic proposals to rapidly expand the exploitation of the space domain also benefited military space programs. "Every major Air Force space program received increased funding."[30] Kennedy's pursuit of dominance in space demonstrates his part as an advocate in shaping a space-minded culture.[31]

Finally, President Kennedy appointed James E. Webb as the second administrator of NASA on 14 February 1961. Webb had a reputation as a political mastermind and

[24] Walter McDougall, …the Heavens and the Earth, 143.
[25] Michael. Sheehan, The International Politics of Space, 43.
[26] Howard McCurdy, Faster, Better, Cheaper: Low-Cost Innovation in the U.S. Space Program (Baltimore: Johns Hopkins Press, 2003), 32.
[27] Everett C. Dolman, Astropolitik: Classical Geopolitics in the Space Age (London: Frank Cass, 2002), 109.
[28] David N. Spires, Beyond Horizons: A Half Century of Air Force Space Leadership, 98.
[29] Walter McDougall, …the Heavens and the Earth, 303.
[30] David N. Spires, Beyond Horizons: A Half Century of Air Force Space Leadership, 98.
[31] Walter McDougall, …the Heavens and the Earth, 302.

maneuvered his way through the Washington bureaucracy to accumulate the funding and resources necessary to achieve the President's vision of landing men on the moon.[32] When Webb took charge, NASA consisted of 6,000 people. By 1965 more than 411,000 people worked on the space program, 90% of whom were private contractors with the remainder being NASA employees. NASA's budget followed a similar trend, increasing from less than a billion dollars in 1961 to $5.1 billion in 1964.[33] Increasing budgets and a mutually dependent relationship with NASA encouraged Air Force leaders that they would have a voice in future space operations.[34] Webb led the race to the moon for the next seven years, but left NASA prior to a successful lunar landing. The Apollo 1 tragedy that took the lives of three astronauts on the launch pad tarnished his reputation and led to his earlier than anticipated departure.[35] However, without his advocacy for the space program and his ability to organize and manage the large-scale Apollo project, it is unlikely that the first moon landing would have happened as soon as it did. His efforts epitomized the Kennedy administration's goal of a national and integrated space program between NASA and the Department of Defense and supported the Air Force's pursuit of a leadership role in military space programs.[36]

Presidents Eisenhower and Kennedy and NASA Administrator Webb were important advocates for the national space program. The early formative focus of the space program and their advocacy fostered a national mindset that supported advancement in the space domain. These leaders motivated the average citizen to develop a sense of space-mindedness that carried over to military space operations. Within this environment, advocacy by Air Force leaders forged a lead role for the service in military space efforts.

Generals Bernard Schriever, Thomas D. White, and James V. Hartinger exhibited powerful advocacy and mentorship that fostered a cohesive and operationally-oriented space-minded culture. Brigadier General Schriever found himself in a position to guide

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[32] National Aeronautics and Space Administration Biography website, http://history.nasa.gov/Biographies/webb.html (accessed 8 March 2011).
[33] Walter McDougall, …the Heavens and the Earth, 362.
[34] David N. Spires, *Beyond Horizons: A Half Century of Air Force Space Leadership*, 99.
[35] National Aeronautics and Space Administration Biography website, http://history.nasa.gov/Biographies/webb.html (accessed 8 March 2011).
[36] David N. Spires, *Beyond Horizons: A Half Century of Air Force Space Leadership*, 98.

the military use of space. According to Mike Moore, Schriever was one of the most brilliant and influential people in the history of the service.[37] Timing and circumstance led Schriever to head the Atlas ICBM program in 1954.[38] Schriever had a distinguished reputation for leading research and development efforts-- he pioneered the concurrency system of testing major subsystems simultaneously instead of sequentially. Concurrency increased risk, but shortened lengthy development timelines.[39] Schriever also applied the concept of configuration management to the space program, producing a highly-structured development process that linked cost, schedule, and technical specifications.[40] When the USAF promoted him to the rank of general and appointed him the commander of Air Force Systems Command, Schriever's influence as a space advocate peaked. From this position, his advocacy led the Department of Defense to give the Air Force "prime responsibility for military space."[41]

Not only was Schriever an advocate, but he also served as a mentor for junior officers in the space field. Thomas P. Hughes, in his history of the Atlas program, asserted that Schriever "nurtured a culture attractive to high-technology engineers and scientists, who, in turn, provided the talent needed to solve the difficult research and development problems of Atlas."[42] Throughout the many programs he was involved in, Schriever mentored his staff of space and missile officers and civilians, kept them informed of his philosophy, and maintained a focused team effort on the space mission.[43] In essence he fostered a cohesive and operationally-oriented space-minded culture.

General Thomas D. White served as the USAF Chief of Staff from 1 July 1957 to 30 June 1961, a crucial period for the military space efforts. As the Air Force gained a foothold in its effort to lead the other services in this environment, General White recognized the necessity to organize for future success. He orchestrated a major reorganization of the service in March 1960 to facilitate the management of space and

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[37] Mike Moore, *Twilight War: The Folly of US Space Dominance* (Oakland, CA: Independent Press, 2008), 189.
[38] Walter McDougall, *…the Heavens and the Earth,* 106.
[39] Walter McDougall, *…the Heavens and the Earth,* 128.
[40] Howard McCurdy, *Faster, Better, Cheaper*, 86.
[41] David N. Spires, *Beyond Horizons: A Half Century of Air Force Space Leadership,* 98-99. – see also Neil Sheehan, *A Fiery Peace in a Cold War: Bernard Schriever and the Ultimate Weapon* (New York, Random House Inc., 2009).
[42] Thomas P. Hughes, *Rescuing Prometheus* (New York: Pantheon Books, 1998), 69.
[43] Howard McCurdy, *Faster, Better, Cheaper*, 85.

missile programs.[44] The reorganization moved all missile programs to Norton Air Force Base, CA and kept all the space programs in Los Angeles.[45] Air Force efforts to rapidly move forward in this new domain threatened the Army and Navy. General White fended off their challenges and argued that "the Air Force would provide effective leadership for the nation's space program and be responsive to the needs of the other services," according to historian David Spires.[46] An archetype of senior mentorship, future space leaders emulated General White's tenacity for asserting Air Force prominence in space. During the Carter administration's 1977 space policy review, they asserted the five principles initially articulated by General White in 1960, and thus reaffirmed the service's lead role.[47] Those five principles, which shaped an operational focus for military space efforts, were: recognition of aerospace as an operating domain, military space managed by a single service, deployment of space systems tied to space applications, guarding the principle of space for peaceful purposes, and cooperation with NASA.[48] General White's advocacy and mentorship were, therefore, essential to building a space-minded culture in the Air Force.

General James V. Hartinger was a career pilot who happened to be Commander-in-Chief of North American Aerospace Defense Command at another key point in space history for the USAF. At the direction of Chief of Staff General Lew Allen, General Hartinger developed reorganization proposals to establish a major command responsible for space missions. When General Allen announced Space Command's establishment in June of 1982, he appointed General Hartinger as its first commander.[49] Unfortunately, Strategic Air Command and Air Force Systems Command each owned Air Force space resources when General Hartinger stood up his new command. Hartinger recognized the need to consolidate the service's operational space missions into a single military organization. By recruiting the Air Force Systems Command Space Division commander to also serve as the first Space Command vice commander, Hartinger brought the

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[44] David N. Spires, *Beyond Horizons: A Half Century of Air Force Space Leadership,* 89.
[45] David N. Spires, *Beyond Horizons: A Half Century of Air Force Space Leadership,* 90.
[46] David N. Spires, *Beyond Horizons: A Half Century of Air Force Space Leadership,* 172.
[47] David N. Spires, *Beyond Horizons: A Half Century of Air Force Space Leadership,* 190-91.
[48] David N. Spires, *Beyond Horizons: A Half Century of Air Force Space Leadership,* 191.
[49] David N. Spires, *Beyond Horizons: A Half Century of Air Force Space Leadership,* 203-205.

operational and systems-development communities together during this transition.[50] The members of these two otherwise disparate cultures thus developed shared norms, cohesion, and an operational orientation within the command's emerging space-minded culture.[51] Operation Desert Storm validated these efforts. "Military analysts concluded that, in Desert Storm, space systems contributed to victory in the political battle, ensured effective command and control, and helped make the war a short conflict."[52] General Hartinger's role as an advocate and mentor in the early days of Space Command contributed to shaping a space-minded culture ready to support military operations.

In the initial stages of the US space program, political figures acted as advocates. Their belief in and commitment to new missions taking place in a new domain was essential to creating national space-mindedness as well as building up national industry and infrastructure that would help to grow and sustain the military space sector. The resolve of these political leaders to push their national space policy agenda forward trickled down to Air Force leaders who eventually secured the service's lead role in military space operations. These military leaders effectively garnered the responsibility and resources needed to advance the military space mission. They kept their staffs involved in the process and effectively relayed their philosophies. Air Force leaders contributed significantly to building recognition for space as an independent operating domain and fostering a space-minded culture among the professional military members performing that mission.

Education and Training of Space and Missile Operators

Shared norms developed through common experiences should contribute to shaping cohesive and operationally-oriented *domain*-minded cultures. Department of Defense Directive 3100.16, dated 26 January 2009, establishes as DoD policy that "a trained, educated, and experienced cadre of space professionals, expert in space planning, programming, acquisition, operations, requirements, science and technology, research and development, and other space-related support disciplines, will be available to

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[50] David N. Spires, *Beyond Horizons: A Half Century of Air Force Space Leadership,* 215.

[51] Carl M. Jones, *Breaking Glass Without Getting Cut: A Construct to Strengthen Space Cadre Subculture* School of Advanced Air and Space Studies Thesis, (Maxwell AFB, AL, 2007), 18.

[52] David N. Spires, *Beyond Horizons: A Half Century of Air Force Space Leadership,* 215.

develop, acquire, and utilize space capabilities for the full spectrum of national security operations."[53] This directive highlights the importance of education and training for military space personnel. The Air Force stresses formal training for its space and missile operators. The Air Force Officer Classification Directory (AFOCD) states that upon accession into the field, all Space and Missile Operations Officers must attend the same formal training.[54] The AFOCD also contains the educational qualifications required of Air Force Space and Missile Operations Officers, which are very broad. Therefore, the Air Force relies more on formal training than educational background to build a common language for the members of this career field, which facilitates the development of a cohesive space-minded culture within the service.

The Air Force established the space and missile operations career field to "operate and manage space and missile operations systems," and it classifies members of this career field with the 13SXX Air Force Specialty Code (AFSC).[55] The Space and Missile Operator field is subdivided into five specialty shredouts, designated by the last character in the AFSC: A – Satellite Command and Control, B – Spacelift, C – Missile Combat Crew, D – Space Surveillance, and E – Space Warning. As mentioned, the educational backgrounds of 13SXX officers vary; the Air Force will accept undergraduate degrees in management, business administration, economics, mathematics, science, engineering, computer science, or space operations. According to the AFOCD, those specializing in either the D or E shredout must also complete two semesters of calculus and one semester of physics.[56] The Air Force Personnel Center (AFPC) reports that 748 officers joined the 13SXX career field between 2 January 2006 and 30 December 2009.[57] These officers held undergraduate degrees in 139 different educational specialties. Pilots and space and missile operators both share broad-based educational backgrounds, but 13SXX officers have less time to develop a common language foundation for their space-minded culture since their formal training program is significantly shorter, yet very technically focused.

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[53] Department of Defense Directive 3100.16, *DoD Management of Space Professional Development* (January 26, 2009), 1.

[54] Air Force Officer Classification Directory (AFOCD): The Official Guide to the Air Force Officer Classification Codes, OPR: HQ AFPC/DPSIDC (31 October 2010), 59.

[55] Air Force Officer Classification Directory, 59.

[56] Air Force Officer Classification Directory, 60.

[57] Data on undergraduate degrees for 17D, 13S, and 11X personnel provided by Air Force Personnel Center assignment teams.

The AFOCD outlines a laundry list of knowledge requirements mandatory for the 13SXX AFSC. Some of the more technical knowledge requirements include: communications system fundamentals, orbital mechanics, launch trajectory and reentry concepts, spacelift and rocket propulsion, C2 structure, and nuclear codes and code handling procedures. The Space 100 course, offered by the 392nd Training Squadron at Vandenberg AFB, CA, teaches space and missile operators entering the career field this technical knowledge. Captain Craig Roblyer, a 392nd TRS Assistant Flight Commander, explained that the course "prepares Airmen for a career in space and missiles."[58] The course lasts 35 days and "covers basic information that allows the students to understand the language of space career fields."[59] Schein argues that in order for groups to function effectively they must develop a common language; the space and missile community strives to accomplish that goal in the Space 100 course.[60] Air Force Space Command indoctrinates its new members rapidly, especially compared to the nearly two years the service takes indoctrinating its pilots.

The Air Force assigns 13SXX officers to a specific shredout after they complete the Space 100 course. Graduates then attend Initial Qualification Training (IQT) specifically targeted for their particular shredout. The 392nd TRS conducts IQT courses for satellite C2 and missile combat crew operators. The 392nd TRS Detachment 1, located at Schriever AFB, CO, teaches the IQT courses for satellite C2 operations, space surveillance, and space warning. The Air Force considers its 13SXX officers current and mission qualified once they complete IQT, which can range from 7-13 weeks, then it sends these newly-trained officers to operational units to apply what they have learned.[61] All Space and Missile Operations officers, regardless of shredout, complete upgrade training to enhance their skills and refresher training courses to remain current and mission qualified.

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[58] Airman 1st Class Heather R. Shaw, Vandenberg Air Force Base Website, *Space 100: Introduction to 'Final Frontier'* (30th Space Wing Public Affairs, May 21, 2009), http://www.vandenberg.af.mil/news/story.asp?id=123150519 (accessed 17 Mar 2011).
[59] Airman 1st Class Heather R. Shaw, Vandenberg Air Force Base Website, *Space 100: Introduction to 'Final Frontier'* (30th Space Wing Public Affairs, May 21, 2009), http://www.vandenberg.af.mil/news/story.asp?id=123150519 (accessed 17 Mar 2011).
[60] Edgar H. Schein, *Organizational Culture and Leadership* (San Francisco: Jossey-Bass, 2004), 93.
[61] Airman 1st Class Heather R. Shaw, Vandenberg Air Force Base Website, *Space 100: Introduction to 'Final Frontier'* (30th Space Wing Public Affairs, May 21, 2009), http://www.vandenberg.af.mil/news/story.asp?id=123150519 (accessed 17 Mar 2011).

Acculturation is a challenge commonly faced by organizations admitting new members, and may also be a hardship for emerging cultures. Schein asserts "after a group has a culture, it will pass elements of this culture on to new generations of group members."[62] Since a shared language can help members communicate and understand one another, teaching new members the culture's common language can help overcome the acculturation barrier.[63] Prompt training and indoctrination of officers in the 13SXX career field enables them to quickly learn a common language and shared norms that are part of the space-minded culture. The Air Force relies on the Space 100 and IQT training courses to teach that common language, forge the culture, and integrate new members.

Divergent Career Paths – Missiles vs. Space Operations

Less divergent career paths, and the absence of barriers to changing career paths, play a role in shaping cohesive and operationally-oriented *domain*-minded cultures. The Air Force established the 13SXX career field, with its five specialty shredouts, in 1994. Prior to that time, space operations and intercontinental ballistic missile operations were separate USAF career fields. The distinct responsibilities associated with each space and missile specialty let the service assign personnel to accomplish these disparate missions. The Air Force needs many junior officers to man its numerous missile launch complexes continuously, but has far fewer missile positions as missileers rise in rank. According to a RAND Corporation report, the Air Force assigns approximately 70% of all its 13SXX lieutenants to missile combat crew positions.[64] The Air Force generally assigns its missileers to positions within the other 13SXX shredouts as they progress rank. Because of the disparity in number of positions by rank between these shredouts, a majority of space and missile officers begin their careers as missileers and transfer into space operations jobs. As space and missile officers transition between specialties they are required to complete the 7-13 week IQT course for the job they are entering. Space operations IQT classes generally consist of two-thirds new accessions and one-third

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[62] Edgar H. Schein, *Organizational Culture and Leadership,* 19.
[63] Edgar H. Schein, *Organizational Culture and Leadership,* 94.
[64] Georges Vernez, Craig Moore, Steven Martino, and Jeffrey Yuen, *Improving the Development and Utilization of Air Force Space and Missile Officers,* 2.

officers cross-flowing into a different specialty.[65] Since so many officers transition from missiles to space operations, the barriers between these career paths remain low; the space officer career field, therefore, is much less divergent than the pilot career field in which individuals seldom shift between CAF and MAF career paths.

Missileers tend to be viewed as the more warrior-like, operational members within the career field due their organizational roots in Strategic Air Command and the awesome power of their weapons. Those within the space operations shredouts, on the other hand, support war fighters operating in all of the other military domains. The AFOCD states that missile combat crew members must maintain readiness to launch ICBMs.[66] They must constantly maintain a warrior mentality and always be ready to turn the key in order to defend the interests of the United States. Although this mission remained consistent over decades, the Air Force placed ownership of the ICBM mission in four different MAJCOMs over the years. Strategic Air Command (SAC) held initial responsibility for the ICBM mission; it then transferred to ACC for a short period, and eventually landed in AFSPC in 1993.[67] Air Force Global Strike Command took responsibility for ICBM operations when the Air Force stood it up in 2009 and is currently accountable for maintaining America's 450 Minuteman II missiles. The command claims, "ICBMs, and the people who operate them, have remained on continuous, around-the-clock alert since 1959."[68] This claim reinforces the warrior nature of the missileers who are part of the space-minded culture. The capability to deliver a kinetic weapon anywhere around the globe, on a moment's notice, fosters an operational mindset among missile crew members that is similar to that of combat aviators.

The operational attitude and mindset of missileers may contrast with the other specialties in the career field. The remaining shredouts play supporting roles similar to those of mobility aviators. Many of the supporting roles of space operations officers can

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[65] Space operations IQT class ratio is based on authors conversations with IQT instructors, AFPC 13SXX assignment team, and Air Force Space Command 13SXX functional management office.

[66] Air Force Officer Classification Directory, 59.

[67] Air Force Space Command Main Heritage website, http://www.afspc.af.mil/heritage/index.asp (accessed 6 March 2011).

[68] Air Force Space Command Main Heritage website, http://www.afspc.af.mil/heritage/index.asp (accessed 6 March 2011).

be bundled under the term "space force enhancement." The National Space Studies Center defines this as: "Combat support operations to improve the effectiveness of military forces as well as support other intelligence, civil, and commercial users."[69] The space force enhancement mission area includes: "intelligence, surveillance, and reconnaissance; integrated tactical warning and attack assessment; command, control, and communications; position, velocity, time, and navigation; and environmental monitoring."[70] By definition, the space force enhancement role generates a mindset for space operations officers that is not as operationally-oriented as that of the missile operators. Soldiers, sailors, and airmen rely on these force enablers to conduct their missions because their dominance over the enemy would degrade without them. While all of these space force enhancement capabilities are critical, none of them independently creates or delivers kinetic effects against an enemy – they enable other combat forces to do so.

The space and missile operations career field offers a unique opportunity to experience military operations from both the warrior and support perspectives. Missile combat crew members experience the operational warrior mindset as they prepare themselves to hurl massive and powerful weapons against an enemy, while space operations officers play a critical role in maintaining space superiority and force enhancement for military operations in the air, cyber, land, and sea domains. Nevertheless, the barrier for crossing over from missile operations to space operations is permeable and a frequent occurrence for this career field. Largely one-way cross-flow within the space-minded culture prevents competing subcultures from gaining hold, unlike with their aviator brethren where the CAF and MAF subcultures are distinct. The cross-flow helps to propagate both operational and support mindsets throughout the career field; and helps to foster a more cohesive and operationally-oriented space-minded culture among the larger space and missile operations community.

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[69] National Space Studies Center website, http://space.au.af.mil/enhance.htm (accessed 14 May 2011).
[70] National Space Studies Center website, http://space.au.af.mil/enhance.htm (accessed 14 May 2011).

Schein's Levels of Analysis and the Space-minded Culture

        Once again, the discussion of these four variables demonstrates how each contributes to fostering a cohesive and operationally-oriented space-minded culture within the USAF space and missile career field. This section provides an overview of the space-minded culture with regard to Schein's organizational levels of analysis. Artifacts are as prevalent within the space-minded culture as among pilots. For the space-minded culture these also include organizational shields representing squadrons, groups, wings, NAFs, and the MAJCOM performing the space and missile mission. Figure 2 below depicts the space and missile cultures' organizational shields from the MAJCOM and NAF organizational levels. A common trait in each of these shields is a circular representation of the globe, indicating the global nature of the space and missile missions. All of the shields also contain stars which symbolize the space domain. Another notable point is the presence of wings on the NAF shields. Each NAF inherited its shield from a World War II flying organization. The Fourteenth Air Force adopted the "Flying Tiger" from the Air China Task Force and has used it as a symbol since 1943.[71] The Twentieth

Figure 2: MAJCOM and NAF Organizational Shields
Source: Air Force Space Command and Air Force Global Strike Command public websites

Air Force stood up in 1941 as a B-29 Superfortress unit; undeniably , Twentieth Air Force bombers dropped the atomic bombs on Japan.[72] Other items characteristic of this operating domain, and which symbolize space-mindedness, are the flight suits that space and missile operators wear, the unique badges worn on those uniforms, and the missiles or satellite systems which represent the space-minded culture. Prior to, and for some

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[71] Vandenberg Air Force Base Website, 14th Air Force History factsheet, http://www.vandenberg.af.mil/library/factsheets/factsheet.asp?id=4685 (accessed 20 May 2011).
[72] FE Warren Air Force Base Website, 20th Air Force Factsheet, http://www.warren.af.mil/library/factsheets/factsheet.asp?id=4697 (accessed 20 May 2011).

time after the career field merger, space officers wore the space operations badge and missile officers wore the missileer badge. In 2004, General Lance Lord, as commander of AFSPC, introduced the space professional badge which replaced the space operations badge and the missileer badge.[73] Air Force Chief of Staff General T. Michael Mosley subsequently reinstated the missileer badge in 2008; the badge is currently awarded to those performing ICBM duties and is worn in conjunction with the space professional badge.[74] Figure 3 depicts the former space and missile operations badge on the left, the space professional badge in the middle, and the missileer badge on the right. All three of the badges display stars, and the two space badges have orbits symbolizing space mission. The space professional badge has many of the same features as the space and missile operations badge; however, they appear on an elongated background reminiscent of aeronautical wings. In addition to stars, the missileer badge displays a missile representative of that distinct mission. These artifacts are items which are easily observed and represent the space-minded culture.

Figure 3: Space and Missile Operations Career Field Badges
Source: The Official US Air Force Website

Organizations generally document and teach Espoused Beliefs and Values to members of an organizational culture. They typically suggest ideals, goals, and aspirations of the organization.[75] Within the space-minded culture, the qualifications for entrance into the space and missile career field, as outlined in the AFOCD, echo the

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[73] Wikipedia Space and Missile Badge website, http://en.wikipedia.org/wiki/Space_and_Missile_Badge (accessed 14 May 2011).
[74] Ed White, The Official Website of the US Air Force, *Officials Bring Back Missile Badges, Wings* (Air Force Space Command Public Affairs Office, Wright-Patterson AFB, OH. 6 June 2008) http://www.af.mil/news/story.asp?id=123101809 (accessed 14 May 2011).
[75] Edgar H. Schein, *Organizational Culture and Leadership,* 94.

culture's espoused beliefs and values. The common language and shared norms instilled during Space 100 to all new members of the 13SXX profession and during IQT for specialty training is another example of this level of cultural analysis. Throughout a space and missile officer's career he or she ascertains additional beliefs and values when transitioning among the different specialties. A missile combat crew member with a warrior mindset learns the importance of turning the key and launching if they receive authenticated orders to do so. Space operators realize the critical nature of force enhancement and enabling military operations in other domains. Any part of the culture recorded and embraced by its members is included in this level of analysis.

The final level of analysis is the Basic Underlying Assumptions which form the real meaning of a culture. The Air Force core values are part of this level of analysis for the space-minded culture, as they should apply to all Air Force specialties. The previously used expanded definition of space-mindedness (the capacity to protect the nation and its global interests through understanding and maintaining the ability to conduct global, regional, and tactical operations through space) is a deeply-held belief among space and missile operators. Confidence in the concept of deterrence, and the fact it held the Soviet Union at bay for so long, is a critical Basic Underlying Assumption for space and missile operators serving as missile combat crew members. They have sworn to follow orders and launch nuclear missiles knowing the impossibly destructive results of their actions. These Basic Underlying Assumptions are essential to the space-minded culture and set it apart from the other *domain*-minded cultures.

Conclusion

This chapter evaluated the culture of the US Air Force's space and missile operations officers who operate in the space domain. The variables of advocacy and mentorship, education and training, and career path divergence were examined with respect to their role in shaping a cohesive and operationally-oriented space-minded culture. The next chapter examines the current state of the USAF's new Cyberspace Operations officer career field through similar lenses. Analyzing the cultures of all three of the Air Force's operating domains should help the Air Force cultivate a cyber-minded culture.

Chapter 3

USAF Cyberspace Officers – Where Are They Now?

The Air Force's cyberspace operators must focus on operational rigor and mission assurance in order to effectively establish, control, and leverage cyberspace capabilities. The new cyberspace operator badge identifies our cyberspace professionals with the requisite education, training, and experience to operate in this new critical domain. The badge symbolizes this new operational mindset and the Air Force's commitment to operationalize the cyberspace domain.

Lieutenant General William T. Lord

Evolution of the USAF Cyberspace Officer

The Air Force completely transformed its communications career field in April 2010 as it acknowledged the military potential of its newest operational domain – cyberspace. This transformation shifted the career field's role from mission support to combat operations. Three thousand USAF communications officers transitioned to the new cyberspace operations officer career field. The Air Force needs its cyberspace officers to do more than merely ensure the base computer networks are operating; they now must organize, train, and equip to utilize cyberspace capabilities to improve the war-fighting posture of the nation's military.[1] The shift from performing a purely mission-support role to one which projects power and creates effects in a new operational domain is simply another juncture in the on-going transition of this evolving career field. Schein would refer to this stage of evolution as the cyber-minded culture entering its birth or early growth stage of cultural maturity. This dynamic career field has passed through four historical stages of evolution according to Major Joseph Golembiewski: the signal officer, the communications-electronics officer, the computer officer, and now the cyberspace officer.[2] A brief review of the history of the cyberspace career field provides a useful context for analyzing the cyber-minded culture as it currently exists. Schein would consider the transition between epochs as the destruction and rebirth of a new organizational military subculture. Throughout the first three epochs of the career field's

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[1] Rolfsen, Bruce, *3,000 Officers Switch to Cyberspace Specialty,* Air Force Times Online. May 17, 2010. http://www.airforcetimes.com/news/2010/05/airforce_cyber_careers_051710/ (accessed 28 Mar 2011).
[2] Maj. Joseph R. Golembiewski, *From Signals to Cyber: The Rise, Fall, and Resurrection of the Air Force Communications Officer,* Maxwell AFB, AL School of Advanced Air and Space Studies, (June 2010).

history, the cyberspace officer played a mission support role by enabling combat operations in the other operational domains. Not until the final epoch, the cyberspace era, have members of this career field been compelled to adopt an operationally-oriented mindset. Figure 4 depicts a timeline for the four stages identified by Major Golembiewski.
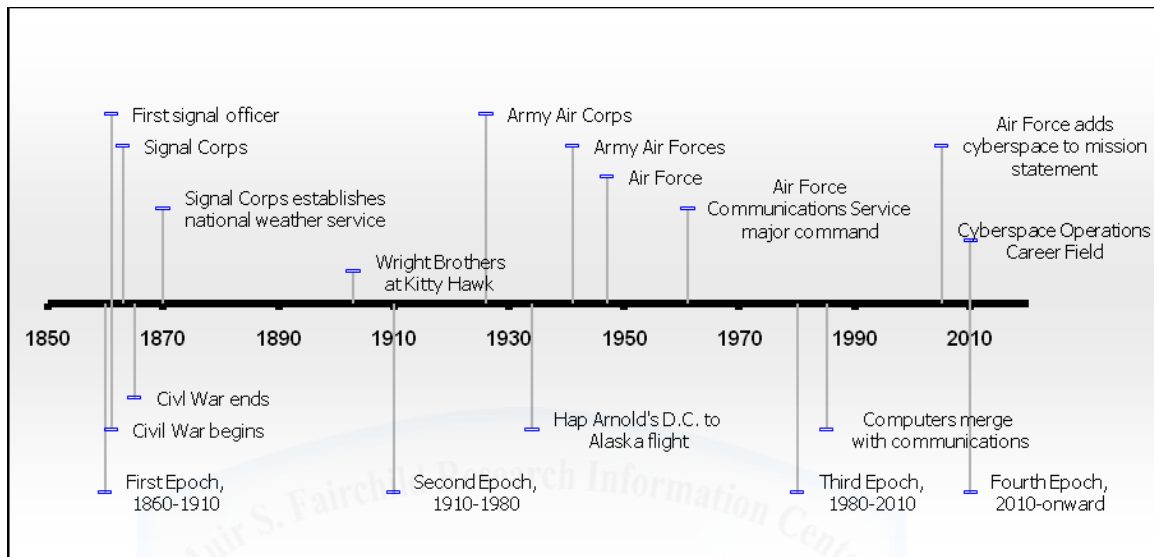
Figure 4: Overall Cyberspace Operations Officer Timeline

Source: Maj Joseph R. Golembiewski, *From Signals to Cyber: The Rise, Fall, and Resurrection of the Air Force Communications Officer*

The Army first recognized the signal officer function as a necessary specialty in 1860, the beginning of the signal officer epoch. Signal officers communicated messages to distant troops via the use of signals transmitted with flags and torches.[3] Evolving technology aided and complicated the signal officer's responsibilities. The telegraph accelerated communications by transmitting messages through electronic impulses sent over wires and soon altered the balance of forces on the battlefield.[4] As telegraph technology emerged, so did the role of the signal officer; commanders quickly demanded mobile telegraph capabilities for forces on the move. Fielded forces linked via telegraph held a distinct advantage; they could update headquarters on current and rapidly changing situations, and commanders could update their intent as situations unfolded. As the

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[3] Maj. Joseph R. Golembiewski, *From Signals to Cyber,* 12.

[4] Elizabeth C. Hanson, *The Information Revolution and World* Politics (Lanham, MD: Rowman & Littlefield, 2008), 20.

technology matured, signal officers used their networks to relay weather information, further supporting combat forces.[5] This initial evolutionary stage set a mission support-oriented tone for the cyberspace operations officers career field; a tone carried forward into the next stage.

The communications-electronics officer epoch, as identified by Major Golembiewski, coincided with the birth of military flight as radio communications freed signal officers from their land-locked telegraph chains. The bond between aviators and communicators started in 1910 when the ability to communicate wirelessly by radio transmission enabled aerial communications.[6] Communications-electronics officers learned specialized skills in the field of electronics and the use of the electromagnetic spectrum to provide communications support to pilots. Pilots needed a means of communicating with someone on the ground when flying over long distances; communications-electronics personnel manned ground stations across the United States to deliver that means. The Air Force established a distinct communications-electronics functional specialty in 1947 when it became an independent service. The Air Force eventually divided this field into sub-specialties which included radar, cryptology, radio, and telephone functions.[7] In the early 1960s, the service integrated the concept of command and control into the communications mission, and USAF leaders established a new major command to oversee these capabilities. The Air Force stood up the Air Force Communications Service in July 1961 and deemed it responsible for command, control, and communications (C3). The C3 mission was yet another support role in the history of the cyberspace officer. The Air Force re-designated the Air Force Communications Service as the Air Force Communications Command in 1979. This new MAJCOM faced a new challenge – the era of the computer.[8]

The computer officer epoch, as characterized by Major Golembiewski, started in 1980. Once again the introduction of new technology – the computer this time – led to the destruction and rebirth of this career field's culture. The enormous benefits of computer automation led the Air Force to establish a computer systems officer career

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[5] Maj. Joseph R. Golembiewski, *From Signals to Cyber, 20-23.*
[6] Benjamin D. Foulois and Carroll V. Glines, *From the Wright Brothers to the Astronauts: The Memoirs of Benjamin D. Foulois* (New York: McGraw-Hill, 1968), 71-73.
[7] Maj. Joseph R. Golembiewski, *From Signals to Cyber, 43.*
[8] Maj. Joseph R. Golembiewski, *From Signals to Cyber, 47.*

field. This new specialty, initially independent from the communications officer career field, emerged from the data automation functions being performed within the finance field. In 1985 the Air Force merged communications-electronics officers and computer systems officers into a new information systems career field.[9] Information systems officers faced increased leadership opportunities following the merger, since there were more people and units in this new specialty. These officers became communications-computer officers in 1986 when the Air Force renamed the career field.[10] In 1990, as a result of force draw downs and reduced manning, the Air Force began dismantling the Air Force Communications Command. When the command's manning dropped by over 80%, many communications units became squadrons assigned to host base wings rather than the major command. "Status of the Air Force Communications Command changed from a major command to a field operating agency of the United States Air Force on 1 July 1991."[11] In 1996 the communications-computer field merged again, this time with the information management and visual information fields. With the addition of many non-technical responsibilities, this merger diluted the technical proficiency of the career field.[12] Numerous mergers and reorganizations during this era led to a generalized cyberspace officer who functioned in a broad mission support-oriented role, one that provided war fighters with services enabled by communications and computer technologies.

The Air Force created an opportunity for its cyberspace officers to shed their support stereotype and delve into an operational arena once it recognized cyberspace as one of its major operating domains. Senior Air Force leaders began touting the operational potential of the cyberspace domain in 2005 and created an operational Air Force Specialty Code for its communications officers in 2010.[13] Such actions signal that a transition is underway within the career field, but its members must adopt a new cultural mindset to complete the transformation. The Air Force, however, can learn from

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[9] Maj. Joseph R. Golembiewski, *From Signals to Cyber, 58-59.*
[10] Maj. Joseph R. Golembiewski, *From Signals to Cyber, 61.*
[11] Air Force Historical Research Agency website, http://www.afhra.af.mil/factsheets/factsheet.asp?id=10977 (accessed 15 May 2011).
[12] Maj. Joseph R. Golembiewski, *From Signals to Cyber, 62-76.*
[13] Air Force News Statement, 8 December 2005, http://www.af.mil/news/story.asp?storyID=123013440 (accessed 24 Jan 2011).

its previous experiences shaping air-minded and space-minded cultures to help its cyberspace officers complete the transition to a cohesive and operationally-oriented culture in its newest operational domain.

Advocacy and Mentorship

The Air Force's most senior leaders advocated for recognizing cyberspace as an operating domain and developing cyberspace war fighting capabilities. In response to a changing security environment, Secretary of the Air Force Michael W. Wynne and Air Force Chief of Staff General T. Michael Moseley incorporated cyberspace into the Air Force mission statement in 2005. In November 2006 Secretary Wynne announced plans for creating a new MAJCOM – Air Force Cyberspace Command. The 8th Air Force at Barksdale AFB, LA led the effort to establish this new MAJCOM responsible for the cyberspace mission. Outlining the objective of the command, Secretary Wynne stated, "The aim is to develop a major command that stands alongside Air Force Space Command and Air Combat Command as the provider of forces that the president, combatant commanders, and the American people can rely on for preserving the freedom of access and commerce in air, space, and now cyberspace."[14] In late 2008, the Air Force diverted its attention and resources to bolstering nuclear operations and abandoned its plans for a cyberspace MAJCOM. Shortly thereafter, based on guidance from the October 2008 CORONA conference, the service transferred responsibility for the cyberspace mission to Air Force Space Command.[15]

Once Air Force Space Command became responsible for USAF cyberspace operations, it created a new numbered air force (NAF) and different service leaders soon became key cyberspace advocates. The AFSPC commander, General Robert C. Kehler, quickly embraced the mission and recognized its operational potential. In a message to space and missile professionals he asserted: "fully realizing the synergy between the space and cyberspace domains, in October 2008 Air Force leaders decided to align lead

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[14] The Information Warfare Site, *8th Air Force Named as Cyberspace Command,* Release Number: 011106, (2 November 2006), http://www.iwar.org.uk/iwar/resources/cybercommand/index.htm (accessed 31 Mar 2011)

[15] Maj Gen William T. Lord, "Cyberspace Operations: Air Force Space Command Takes The Lead," *High Frontier: The Journal for Space and Missile Professionals* (Volume 5, Number 3, May 2009), 3, http://www.afspc.af.mil/shared/media/document/AFD-090519-102.pdf (accessed 31 Mar 2011).

cyberspace responsibilities and stand up a new cyberspace operational numbered Air Force (NAF) under Air Force Space Command."[16] AFSPC activated the Twenty-fourth Air Force on 18 August 2009. Figure 5 depicts the new NAF as aligned under AFSPC and the three Cyber Wings aligned under this NAF. Secretary Wynne and General Moseley had previously appointed Major General William T. Lord, a devout advocate of the Air Force cyberspace mission, as the acting AF Cyber Command (Provisional) Commander, and he facilitated the organizational transition of his provisional MAJCOM
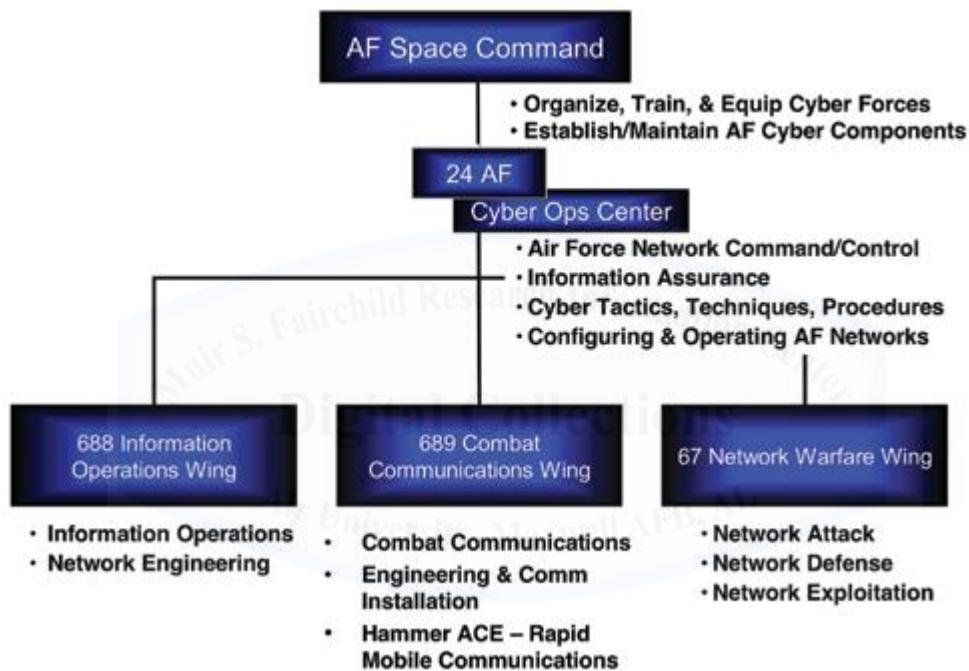
Figure 5: AFSPC and 24 AF Organizational Structure
Source: Maj Gen William T. Lord. "Cyberspace Operations: Air Force Space Command Takes The Lead." *High Frontier: The Journal for Space and Missile Professionals* Volume 5, Number 3 (May 2009): pg. 3.

to a numbered air force within AFSPC.[17] General Lord highlighted the importance of the cyberspace mission when he asserted, "the Air Force, Department of Defense (DoD), and nation as a whole are vulnerable to threats posed in, through, and from cyberspace while

[16] General Robert C. Kehler, "Introduction" *High Frontier: The Journal for Space and Missile Professionals,* (Volume 5, Number 3, May 2009), 2, http://www.afspc.af.mil/shared/media/document/AFD-090519-102.pdf (accessed 31 Mar 2011).
[17] General Robert C. Kehler, "Introduction" *High Frontier: The Journal for Space and Missile Professionals,* (Volume 5, Number 3, May 2009), 2, http://www.afspc.af.mil/shared/media/document/AFD-090519-102.pdf (accessed 31 Mar 2011).

at the same time dependent upon free and unfettered access."[18] By declaring that the service must fight and win in cyberspace, he argued that this mission is critical to our nation's defense. Promoted to Lieutenant General in 2009, General Lord is currently the Air Force's top cyberspace operations officer, serving as the Secretary of the Air Force's Chief of Warfighting Integration and Chief Information Officer, where he continues to advocate for the cyberspace community. The recent shift from a dedicated MAJCOM to a NAF shows that the Air Force's organizational approach toward the cyberspace mission is still evolving; as such, the service remains poised to try different organizational approaches as its fledgling cyber-minded culture matures. Senior cyber leaders, such as Generals Kehler and Lord, can therefore shape this culture through their advocacy and continued mentorship of rising leaders.

Future cyberspace advocates are likely to emerge from key leadership positions within the Twenty-fourth Air Force's cyber wings. Research identified four likely cyberspace advocates and mentors within the NAF. Colonel Robert Skinner is a career cyberspace operations officer and commands the 688th Information Operations Wing (IOW). The 688 IOW develops, trains, exercises, and tests information operations tactics, techniques, and procedures; analyzes and mitigates US cyberspace vulnerabilities; and integrates emerging information dominance capabilities in support of Air Force, joint, and DOD war fighters.[19] Colonel Theresa Giorlando is the 689th Combat Communications Wing Commander. Her wing specializes in expeditionary communications in support of combat and humanitarian relief efforts.[20] She could be a credible cyber advocate in a position to mentor numerous cyberspace operations officers due to her cyber-wing command position and years of cyberspace experience. Colonel Paul A. Welch, a cyberspace operations officer and graduate of the Air Force's School of Advanced Air and Space Studies, is currently the Vice Wing Commander (CV) of the 67th Network Warfare Wing (NWW) that organizes, trains, and equips cyberspace forces

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[18]Maj Gen William T. Lord, "Cyberspace Operations: Air Force Space Command Takes The Lead," *High Frontier: The Journal for Space and Missile Professionals* (Volume 5, Number 3, May 2009), 3-5, http://www.afspc.af.mil/shared/media/document/AFD-090519-102.pdf (accessed 31 Mar 2011).

[19] Colonel Robert J. Skinner, *Biography,* January 2010.

[20] 24th Air Force Website, 689th Combat Communications Wing information page, http://www.24af.af.mil/units/689ccw/index.asp (accessed 31 Mar 2011).

to conduct network defense, attack, and exploitation. [21] He is slated to command the 688th IOW Commander in summer 2011. His experience as a vice wing commander, and the operational knowledge he gleaned, should strengthen his position as a cyberspace advocate and mentor. Finally, Colonel William Poirier, currently attending the National War College, will replace Colonel Welch as the 67th NWW/CV in summer 2011.[22] These career cyberspace operations colonels, assigned to key positions within the service's emerging cyberspace organizational construct, can serve as advocates and mentors shaping the burgeoning cyber-minded culture – facilitating both its cohesion and its operational orientation.

Education and Training

Upon creating the 17DXX career field, the Air Force initially established both undergraduate education and formal training requirements for those becoming cyberspace operations officers. The Air Force Officer Classification Directory (AFOCD) currently summarizes the responsibilities of the cyberspace operations career field as follows:

> Execute cyberspace operations and information operations functions and activities. Plans, organizes and directs operations, including network attack (Net-A), network defense (Net-D), network warfare support (NS), network operations and related information operations. Such operations cover the spectrum of mission areas within the cyberspace domain.[23]

The AFOCD sets strictly defined and technically oriented undergraduate academic requirements for those wanting to enter this career field. They must have a Bachelor of Science degree in cyberspace security, electrical engineering, computer engineering, systems engineering, physics, mathematics, information systems, or information security/assurance. The AFOCD stipulates that officers not meeting these degree requirements may enter the career field if they have 24 undergraduate credit hours of

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[21] 24th Air Force Website, 67th Network Warfare Wing page, http://www.24af.af.mil/units/689ccw/index.asp (accessed 31 Mar 2011).

[22] This research identified career 17D officers as potential advocates and mentors based on positions they are currently assigned to or positions they are projected to move into. Officers from other career fields (13S and 14N specifically) also hold, or have held, leadership positions in Air Force cyberspace organizations and are potential advocates and mentors in the cyberspace domain.

[23] Air Force Officer Classification Directory (AFOCD): The Official Guide to the Air Force Officer Classification Codes, OPR: HQ AFPC/DPSIDC (31 October 2010), 75.

science courses in telecommunications, computer science, mathematics, engineering, and physics. When setting up this career field, the Air Force wanted to limit it to those individuals with technical expertise in the operating domain. The service transferred 723 communications-computer systems officers who had joined the Air Force between January 2006 and December 2009 into the new cyberspace operations officer career field in April 2010. Of these 355, or just under 50 percent, met the new career field's undergraduate degree requirement; the remaining officers held degrees in largely non-technical fields of study.[24]

Aside from education, the Air Force can also use formal training to forge a common language for the members joining its emerging cyber-minded culture. The 333rd Training Squadron, located at Keesler AFB, MS, provides Undergraduate Cyberspace Training (UCT) to officers accepted into the 17D career field. "UCT provides training to personnel in the 17D AFSC, civilians, and international officers under the provisions of the Air Force Security Assistance Program in the knowledge and skills necessary to perform duties of the cyberspace professional."[25] UCT training covers 14 separate subject areas over the course of 23 weeks. Attendees are trained in the technical aspects of the cyberspace domain using lectures, demonstrations, and hands-on exercises aimed at honing their expertise. This universal training experience for all cyberspace operations officers teaches a common language to members of the career field, a first step toward establishing shared norms and shaping a cyber-minded culture. Upon completing UCT, most graduates report to their first permanent duty station to begin developing experience in the field.

Formal training, however, continues for some UCT graduates. Upon completion of the 920 hours of UCT instruction, the top 10 percent of each class – based on test and exercise scores – can attend Undergraduate Network Warfare Training (UNWT) to earn the 17DXA AFSC. Officers in the A-shred perform operational defense, exploitation, and attack missions on numerous computer networks. UNWT is a 13-week course conducted by the 39th Information Operations Squadron at Hurlburt Field, FL. "The

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[24] Data on undergraduate degrees for 17D, 13S, and 11X personnel provided by Air Force Personnel Center assignment teams.
[25] Undergraduate Cyberspace Training Plan of Instruction, 333 TRS, 81 TRG, Keesler AFB, MS (2 November 2010), i.

UNWT course educates students on the basics of warfare in cyberspace; it ensures students are exposed in a hands-on manner to realistic scenarios."[26] Through UNWT, the Air Force is trying to establish an operational orientation for its network warriors. The Air Force typically assigns UNWT graduates, its newest 17DXA officers, to one of its information operations squadrons for their first permanent duty assignment.

The Air Force has also established a cyberspace continuing education program to reinforce the common language and help maintain a higher level of proficiency for those operating in the cyberspace domain. The Air Force Institute of Technology (AFIT) at Wright Patterson AFB, OH conducts Cyber 200 and Cyber 300 courses several times per year. AFIT presents Cyber 200 at the Secret level for the deliberate development of cyberspace professionals 6-11 years into their careers. Those professionals include senior company grade officers, mid-level non-commissioned officers (NCOs), and civilians in the grades of GS11-GS13.[27] Cyber 300 courses are at the TS/SCI level for the deliberate development of career cyberspace professionals with 12-15 years experience. This group includes field grade officers, senior NCOs, and GS13-14 civilians in cyberspace operations or acquisitions positions.[28]

In addition to these continuing education courses, the Air Force is adding a Network Warfare Operations (NWO) Squadron to the USAF Weapons School at Nellis AFB, NV. This new squadron will develop "NWO weapons officers who demonstrate critical planning and execution skills and gain tactical expertise in air, space, and cyberspace integration."[29] Attendees of the cyber weapons school should develop an operationally-oriented warrior mindset as they further enhance their skills to conduct

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[26]1Lt. Ashley Conner, *Air Force Graduates First Network Warfare Class*, Global Security Website, (39th Information Operations Squadron, Hurlburt Field, FL, 13 December 2010), http://www.globalsecurity.org/military/library/news/2007/12/mil-071213-afpn03.htm (accessed 2 Apr 2011).

[27] Air Force Institute of Technology, Cyber 200: Cyber Application Factsheet, Wright-Patterson AFB, OH, http://www.afit.edu/en/docs/CCR/CTS_Cyber200.pdf (accessed 24 May 2010).

[28] Air Force Institute of Technology, Cyber 300: Cyber Integration Factsheet, Wright-Patterson AFB, OH, http://www.afit.edu/en/docs/CCR/Cyber300.pdf (accessed 24 May 2010).

[29] Network Warfare Operations Weapons Instructor Course Development Concept of Operations, HQ AFSPC/A3TW, (2 April 2010), 2.

operations in the cyberspace domain. The Air Force plans to integrate the first class of cyberspace operators into the weapons school in summer 2012.[30]

Since the Air Force controls the education and training requirements it creates for this new career field, they represent a powerful tool to shape the emerging culture. These requirements should focus on teaching a common language to, and developing shared norms among, cyberspace operators. If its initial policies do not produce the results it wants, the service should modify them appropriately before inertia sets in and they are too difficult to change. The service has a vested interest in optimizing its education and training requirements to shape a cohesive and operationally-oriented cyber-minded culture.

Divergent Career Paths - Cyberspace Operations vs. Communications Support

When all communications officers became cyberspace operations officers in April 2010, the Air Force assigned them to one of two specialties known as shreds. The 17DXA shred plans, organizes, and performs network defense, exploitation, and attack in support of joint, national, and AF objectives. The 17DXB shred plans, organizes, and performs network operations to include network establishment, network operations, information assurance, and network defense in support of joint, national, and AF objectives.[31] Another way of phrasing the difference between the shreds is: 17DXA officers perform operations on the network, while 17DXB officers ensure that the network operates. The Air Force's goal for operations performed on the network is to defend, exploit, or attack in the cyberspace domain. The service plans to train cyberspace operations officers in the A-shred to create effects against an enemy. These effects may be limited to the cyberspace domain, such as when electronic data is manipulated. At other times, the Air Force might want cyber operations to affect or destroy physical equipment, rather than merely the data residing within it. The service expects the officers in the B-shred to serve a more traditional communications-computer systems officer role, similar to the computer officer epoch characterized by Major Golembiewski. These

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[30] Network Warfare Operations Weapons Instructor Course Development Concept of Operations, HQ AFSPC/A3TW, (2 April 2010), 2.

[31] Air Force Officer Classification Directory (AFOCD): The Official Guide to the Air Force Officer Classification Codes, OPR: HQ AFPC/DPSIDC (31 October 2010), 76.

officers will operate and maintain base networks, telephone systems, and airfield systems. The Air Force currently has more cyberspace operations officers filling the traditional computer officer role than it has network warriors conducting operational missions.

The Air Force assigns a small percentage of its cyberspace operators to the A-shred of the career field with limited barriers to changing career paths. Of the 723 communications-computer systems officer transferred into the new 17D career field, the Air Force made only 64 of them 17DXA officers, assigning the remaining 659 to the B-shred. The Air Force requires less than 10 percent of its cyberspace operations officers to serve in this new operational role. The Air Force provided officers who transitioned from the previous communications-computer systems AFSC the opportunity to apply for the A-shred based on previously held experience.[32] The small number of cyberspace operators designated with the A-shred subsequently aligns with requirements identified on unit manning documents (UMD).

Air Force cyberspace operators may desire to, or be required to, cross-flow between both shreds of the specialty throughout their career, and the barriers to changing career paths should be minimal. Air Force units establish personnel requirements based on the missions the service designates them to perform. An AF-wide analysis of all UMDs on 1 December 2010 revealed 2,600 cyberspace operations officer billets.[33] The Air Force allocated 221, or 8.5 percent, of those billets as 17DXA positions and 2,379, or 91.5 percent, as 17DXB positions. Despite the small number of 17DXA billets, cross-flow between the shreds is likely to happen. Cyberspace operations officers with a 17DXA AFSC are liable to fill communications squadron command or staff officer billets, and they should not require additional training for assignment to those B-shred positions. On the other hand, 17DXB officers desiring assignment to an A-shred billet may have to attend Undergraduate Network Warfare Training or gain the necessary experience. The requirement for additional training would create a minor barrier for those who aspire to fill a role in the network warfare arm of the career field but do not initially qualify for that role. If the cross-flow is only from the A-shred to fill

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[32] Officers desiring the A-shred had to have previously held positions being designated as A-shred billets on a current Unit Manning Document (UMD) or demonstrated experience equivalent to what is required for award of the A-shred

[33] Unit Manning Document data provided by Air Force Personnel Center 17DXX assignment team. Data is for all 17DXX officers O-1 – O-5. Analysis of the data completed by the author.

B-shred positions, the potential exists for a very distinct subculture to form among the network warriors; diminishing the barriers for B-shreds to fill A-shred positions could reduce that potential.

The USAF should continually assess and modify its policy regarding specialization and divergence within the cyberspace operations officer career field. The Air Force probably cannot avoid divergence within the career field it has created for its cyberspace operations officers, but it can be aware of the cultural implications likely to arise as its policies distinguish specialties within the field and either encourage or restrict movement among them during the course of members' careers. A cyber-minded culture will emerge, and the service needs to ensure that it is the right culture. Carefully managed divergence, after all, could contribute to shaping a cohesive and operationally-oriented cyber-minded culture, rather than a small fiefdom of narrowly-focused cyber elites who are blind to the domain's role in the larger context of airpower strategy.

Schein's Levels of Analysis and the Cyber-minded Culture

Schein's levels of analysis help describe the cyber-minded culture as it currently exists. Air Force cyberspace leaders will gain a clearer picture of the culture using the lens offered by Schein; they can then assess and adjust aspects of the culture at different levels of analysis. This culture is emerging, and so is a prominent display of artifacts that symbolize its mission, values, and beliefs. The service's cyberspace organizations have adopted organizational shields that are representative of units performing the cyberspace mission. Figure 6 below shows the shields of the Twenty-fourth Air Force, the 688th Information Operations Wing, and the 689th Combat Communications Wing. Notice that

Figure 6: Air Force Cyberspace Organizational Shields
Source: 24th Air Force Media Gallery website

all of these shields feature lightning bolts. The lightning bolt has grown to symbolize the cyberspace domain. This artifact carried over from the communications-computer systems culture and, is still a symbol used in many communications units' organizational shields. The globe is another obvious icon on each shield, one carried over into the career field badge and tying the cyberspace domain with the USAF's other domains and the larger service culture. Another artifact is the new cyberspace operations badge depicted alongside the communications-computer systems badge in Figure 7. Cyberspace operations officers wear the badge on their uniforms as a visible symbol of their Air Force specialty. The background of the badge contains four lightning bolts aligned in a wing-like structure, once again displaying a common symbol from the cyberspace domain and creating a connection to the air-minded culture. The similarity to "wings" sets it apart from the small oval badge which represents the support role played by communications officers. The globe, also prominent in the organizational shields, signifies the worldwide cyberspace mission. Finally, the orbit represents the space elements of the cyberspace mission and is a link to another of the Air Force's operating domains – the space domain.
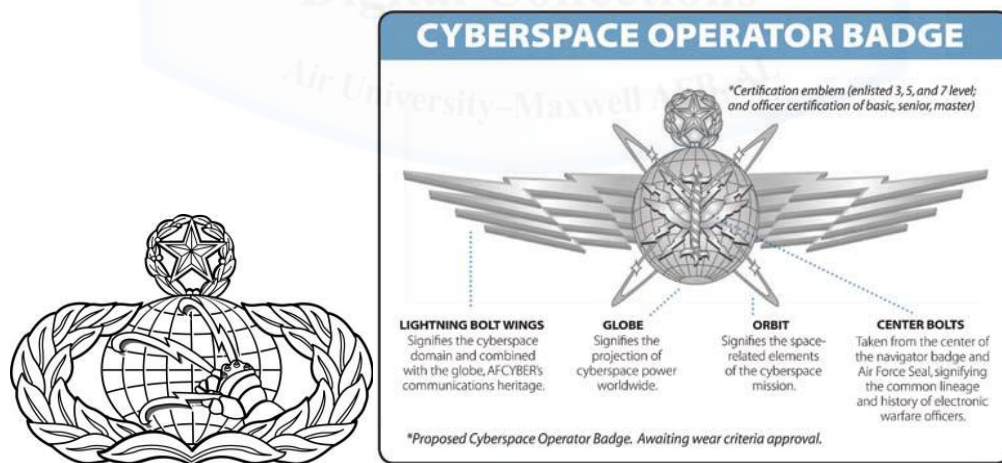
Figure 7: Air Force Communications and Cyberspace Operations Badges

Source USAF Occupational Badges, About.com US Military page and *High Frontier: The Journal for Space and Missile Professionals.*

The emerging cyber-minded culture is beginning to espouse its beliefs and values. The undergraduate education requirements for entrance into the field are well-defined and documented in the AFOCD. These requirements promote the highly technical nature of the career field and the need for the Air Force to have qualified personnel becoming

cyberspace operations officers. The cyber-minded culture is also expressing the importance of formal training and continuing education by establishing classes to include UCT, Cyber 200, and Cyber 300. The units responsible for these courses have developed manuals, briefings, and hands-on exercises to help promulgate a common language for cyberspace operators. The USAF Weapons School stood up a Network Warfare Operations squadron to ingrain critical planning and execution skills into the cyberspace operator mentality. These skills are already taught in the Air Force's other operating domains, stressing their importance to conducting operational missions against an enemy. The Air Force is documenting the beliefs and values of this new operating domain and passing them on to members of the cyber-minded culture, and these efforts should lead to standards that members of the culture embrace.

Basic Underlying Assumptions form the true essence of the culture, and they may take time to evolve in the newly emerging cyberspace domain. Understanding the operational mission of a domain is a Basic Underlying Assumption of the air- and space-minded cultures. Definitions of air- and space-mindedness contributed to this understanding, and therefore offer a good starting point for identifying the same in the cyber-minded culture. The definition of cyber-minded proposed as part of this research is: the capacity to protect the nation and its global interests through understanding and maintaining the ability to conduct global, regional, and tactical operations through cyberspace. Understanding how cyberspace capabilities contribute to the defense of the nation should grow into an unchallengeable aspect of the cyber-minded culture. Air Force cyberspace advocates and mentors should continue to promote cyberspace's importance as an operational domain and foster this Basic Underlying Assumption as the culture emerges. The Air Force Core Values are deeply-held beliefs for all Air Force members, and therefore also apply to the cyber-minded culture. As the cyber-minded culture matures, the Basic Underlying Assumptions will continue to grow into the unchallengeable aspects of the culture that Schein describes and should lead to cohesiveness and a shared operational orientation among cyberspace operators.

Conclusion

Cyberspace operations officers are at the beginning of the cyberspace epoch identified by Major Golembiewski; this chapter looked at the emerging culture associated with this new epoch. The Air Force converted nearly 2,500 support-oriented communications-computer systems officers into cyberspace operators and brings new members into the career field every year. Before the service takes too many steps down the path it initially created for these operators, it should evaluate the foundations it has laid to ensure that they help it build the cohesive and operationally-oriented cyber-minded culture desired. Similar to the other Air Force operating domains, advocacy and mentorship, education and training, and career path divergence each have a role in shaping the culture of this new career field. The analysis of these variables with respect to traditional domains should help to answer the question posed in this research: How can the USAF use its existing air-minded and space-minded cultures as templates to create a cohesive, operationally-oriented, and mature cyber-minded culture and engender cyber-mindedness in the new 17D cyber-officer career field?
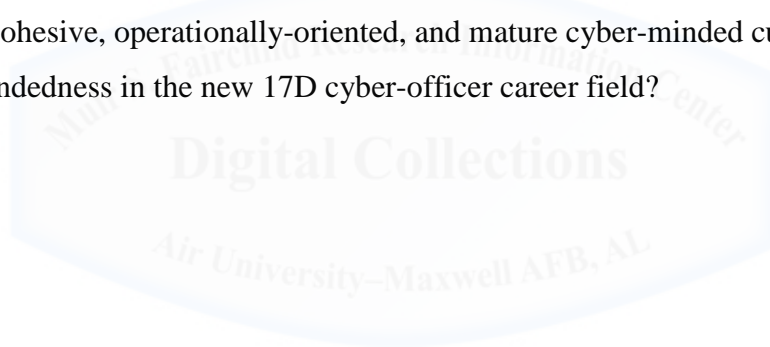
Chapter 4

Building a Cyber-minded Culture

If the enemy is to be coerced, you must put him in a situation that is even more unpleasant than the sacrifice you call on him to make. The hardships of the situation must not be merely transient - at least not in appearance. Otherwise, the enemy would not give in, but would wait for things to improve.

Carl von Clausewitz
On War

Introduction

Many scholars who study organizational culture argue that it heavily influences an organization's ability to succeed and sustain that success over time.[1] The United States Air Force must succeed over the long term not only for its own self-preservation, but because the nation's security is at stake. The Air Force, therefore, must heed factors which impact organizational culture within the service, especially for those subcultures responsible for operating in its three distinct domains. The Air Force must do so in order to understand the unique nature of each operational environment and establish a foundation upon which to manage change and shape the service's *domain*-minded cultures.

The Air Force's top civilian and military leaders have recognized cyberspace as the service's third operating domain. Today's military commanders can employ cyberspace capabilities as another means to compel the enemy to do our will.[2] The commander's ability to exploit cyberspace, or any operating domain, depends to some extent upon the culture among the members of the career fields responsible for performing *domain*-centric operations. This research, therefore, recommends ways to shape a cohesive, operationally-oriented, and mature cyber-minded culture. The two previously exploited domains of air and space offer an historical perspective for establishing an organizational culture within a new sphere of influence. This research analyzed three of the many variables which influence the formation and maturation of

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[1] Kim S. Cameron and Robert E. Quinn, *Diagnosing and Changing Organizational Culture: Based on the Competing Values Framework* (Reading, Massachusetts: Addison Wesley Longman, Inc., 1999), 4.

[2] Carl von Clausewitz, trans. and ed. Michael Howard and Peter Paret, *On War* (Princeton, NJ: Princeton University Press, 1984), 75.

cultures in the military operating domains. Chapters 1 and 2 analyzed advocacy and mentorship, educational background and training, and divergent career paths in the air and space operating environments. Chapter 3 looked at the same variables with respect to the Air Force's initial actions affecting the emergence of a cyber-minded culture. This chapter compares and contrasts the variables' roles in establishing culture in all of the operating domains to glean insights into their potential impact for the future of the cyberspace domain.

Advocacy and Mentorship

Advocacy and mentorship are influential in the formation and maturation of culture in military operating environments. This research proposes that increased levels of advocacy and mentorship should help to foster cohesive and operationally-oriented *domain*-minded cultures. Advocacy by senior leaders, both civilian and military, was extremely important in garnering support to commit people and resources to exploring these domains and learning how to exploit them for military purposes. Mentorship increased in importance after military operations within the domains became prevalent. Leaders from within the career fields performing operations in the respective domains could then pass on their knowledge, experiences, and lessons learned to those they led and thereby foster a culture capable of growing future leaders.

Schein asserts that "culture springs from beliefs, values, and assumptions of founders of organizations."[3] Therefore, advocacy is crucial during the birth and early growth stages of an organization's culture. In the air domain, advocates sought service independence; in the decades leading up to World War II, airpower leaders advocated that air was an independent sphere of influence and that it should be a separate military service. Army Air Corps leaders realized their goal with President Truman's signing of the National Security Act of 1947, establishing an independent United States Air Force. While advocacy in the air domain came from within the military, national interest in the space race with the Soviet Union resulted in initial advocacy from the very highest levels of government. Enthusiastic support from the president and congressional leaders helped to build a national mindset geared to explore the new domain. This space-mindedness

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[3] Edgar H. Schein, *Organizational Culture and Leadership* (San Francisco: Jossey-Bass, 2004), 219.

trickled down to the military services where advocates jockeyed to gain a lead role in space for their military service. After the USAF successfully achieved this goal, continued advocacy led national leaders to recognize space as an independent military operating domain and create a new MAJCOM within the service to manage the space mission. A 2001 Space Commission Report indicated that an independent military department for space may be required in the future to manage the growing space missions. However, in the near term, it considered maintaining a cadre of space professionals in the Air Force as the best option to organize, train, and equip space forces.[4] Similar to the space domain, Air Force advocates for the cyberspace mission are striving for domain independence within the service. Early plans for a cyberspace MAJCOM, and the resultant stand up of a cyberspace numbered air force (NAF), show that the service is trying to provide the mission a degree of independence. While a cyber NAF may be currently appropriate, should the mission expand in the future, the Air Force may need to establish an independent cyberspace MAJCOM. The service has selected officers with space and missile backgrounds as the first two commanders for the Twenty-fourth Air Force. The emerging cyberspace community may have to continue relying on such external advocates to protect their organizational independence while leaders from within the cyberspace community rise to command positions at the NAF and eventually MAJCOM level.

Schein also claims that organizational cultures grow based on "new beliefs, values, and assumptions brought in by new members and new leaders."[5] As an organization's culture matures, mentors from within become new leaders and tend to exert more influence than the advocates who were fundamental in the beginning. Sharing experiences and learning lessons from mentors is indispensible to developing a common mindset among the members of a culture. In both the air and space domains mentors influenced other members of the cultures. Billy Mitchell led a team of aviators that created early air power doctrine and developed tactics to sink ships from the air. Bernard Schriever nurtured a technology-oriented culture and espoused his philosophies to the numerous individuals he led in the emerging space-minded culture. Potential mentors in

[4] Report of Commission to Assess United States National Security Space Management and Organization. 11 January 2001. http://www.dod.gov/pubs/spaceintro.pdf (accessed 31 May 2011), 33.
[5] Edgar H. Schein, *Organizational Culture and Leadership*, 219.

the cyberspace domain are already surfacing. The commanders and vice commanders of the Air Force wings responsible for cyberspace missions are in positions to influence many cyberspace operators. Other mentors may materialize at lower levels of leadership, and they should continually strive to foster a cohesive and operationally-oriented cyber-minded culture.

The advocacy and mentorship variable had similar influence in both the air and space domains, and contributed to fostering a *domain*-minded culture in each. A key difference was that advocacy in the air domain led to an independent service, and in the space domain it led to the recognition of an independent operating domain. Mentorship in both domains facilitated the sharing of expertise and honing of skills for members of the air- and space-minded cultures. By proliferating knowledge through mentorship, aviators and space operators developed shared norms and common operating languages, both indicators that a *domain*-minded culture was emerging. These achievements provide insights for the emerging cyber-minded culture. Cyberspace advocates could maintain the organizational status quo and work on cultivating cyberspace operators to fill leadership positions in the existing NAF. Or, they could continue to strive for greater organizational independence, such as a cyber MAJCOM.

Continued advocacy for a cyberspace MAJCOM would afford a greater degree of organizational independence for the domain and put it on par with the level of independence achieved in the space domain. Establishing and staffing a cyber MAJCOM would create more and higher level leadership positions for cyberspace operators and give them a stronger voice within the service. However, pursuing a MAJCOM could put too much emphasis on the organizational construct and take the new career field's focus off of developing a thriving cyber-minded culture. Senior cyberspace leaders should accept the Twenty-fourth Air Force as the suitable level of domain independence for now and focus on fulfilling their role as mentors. This could afford them time to work with other leaders in the cyberspace operations career field and foster a cyber-minded culture capable of producing a strong cyber NAF poised to become a cyber MAJCOM at a later time.

Education and Training

Building a common language and shared norms are critical during the birth and early growth stages of an organization; education and training are both means to achieve those goals. This research asserts that common educational backgrounds and/or intense formal training should lead to the creation of a cohesive and operationally-oriented *domain*-minded culture. The Air Force does not currently seek to establish common languages and shared norms for its career fields in either the air or space domains through common educational backgrounds; officers entering these fields come from a wide variety of undergraduate degree programs. The service therefore relies on formal training processes in each domain to shape common languages and shared norms for each culture, but it does so through programs which vary in both duration and orientation.

Educational backgrounds among members of a culture can range on a scale of varied to similar undergraduate degrees. Common backgrounds, by and large, help members of a group define their culture. The Air Force has adopted a different approach regarding the educational background of those entering the cyberspace domain than it has for accessions to either of the other operating domains. For entrance into the cyberspace career field, the Air Force established rather technical undergraduate degree requirements. Officers entering this career field should therefore share more common technical backgrounds than their air and space counterparts. The common language and shared norms they develop should also have a more technical focus. Aside from setting educational requirements for its cyber operators, the Air Force has also established formal training for those entering this career field.

Schein claims that cultures develop based on "the learning experiences of group members as their organization evolves."[6] Formal training permits the propagation of a common language and shared norms, and it contributes to cohesive and operationally-oriented *domain*-minded cultures. Pilots spend up to two years in training to become fully qualified in their assigned weapon systems and fluent in the complex language of aviation. Therefore, the building of an air-minded culture or integration into it, occurs very gradually and in concert with developing new skills and proficiencies. During this lengthy training period, they develop cohesion with other members of the culture, and

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[6] Edgar H. Schein, *Organizational Culture and Leadership*, 219.

they acquire an operational orientation by learning how to exploit the air domain for military operations. The Air Force trains its space and missile operators more quickly, and their training is very technical in nature. The Space 100 course teaches the common language of the space domain, and the IQT courses prepare space and missile operators for the specific jobs they will perform. The Air Force institutes shorter formal training for space and missile operators than pilots due to the nature of the training required for each. Training for 13SXX officers has an educational focus which is different than the physical skills and proficiencies pilots need to learn over time in order to fly. At this time, the Air Force has also set up a relatively short, yet technically-oriented, formal training course for its cyberspace operators. Undergraduate Cyberspace Training instills the common cyberspace language, and helps operators in the domain begin to develop shared norms. Given the common technical education requirements for cyberspace operators, and the fact that they do not have to develop physical skills, a formal training program should take less time than traditionally required for aviators. As missions expand in cyberspace, however, 17DXX officers may require lengthier formal training. Declining budgets and small numbers of personnel entering the career field may impede lengthening the current formal training program; however, cyberspace leaders could consider this option as the culture matures.

Education and subsequent career field specific training are influential in building the cultures of the unique military operating domains. Air Force leaders have options with regard to the future of the education and training variable in the cyberspace domain. They can continue down the current path with technical undergraduate degree requirements and formal training that is technologically oriented, but relatively short in duration. This combination of education and training seems appropriate at this time, but cyberspace leaders should continually assess and adjust these career field requirements as necessary. Another approach would be to relax the education requirements, and lengthen the formal training courses. Longer courses could include completing professional computer network certifications that increase technical proficiency. This approach would open the career field up to a larger pool of candidates, and perhaps create a competitive selection process for entrance into the specialty. The longer training should contribute to developing highly competent cyberspace operations officers with professional operating

system and network certifications for the domain where they conduct military operations. On the other hand, relaxing the stringent undergraduate education requirements could create a group of officers with disparate backgrounds and no initial common language. In addition, the Air Force may have difficulty increasing the length and intensity of formal cyber training considering current budget pressures to reduce operating costs.

Another option would be to establish more demanding entrance requirements, to include mandating technical undergraduate degrees and professional certifications prior to entering the cyberspace career field. This alternative would create a young cyber officer corps entering the service already proficient at operating in the cyberspace domain. New accessions meeting more stringent entrance requirements would also have a higher degree of initial commonality that could speed the emergence of a cyber-minded culture. By requiring its new cyber officers to have higher levels of proficiency, the Air Force might also save money by reducing its in-house training requirements. However, stricter entrance requirements would vastly reduce the pool of qualified candidates, and possibly risk the chance of not meeting personnel requirements for the career field. In addition, under this alternative cyber operators would receive most of their training prior to entering the Air Force and that would reduce the service's influence in shaping a military cyber-minded culture. Each alternative, to include maintaining the service's current cyber education and training program, involves pros and cons. Air Force cyberspace leaders should allow the current educational requirements and formal training program to mature, and continually assess and consider all the options presented in this research as possible adjustments in the future.

Divergent Career Paths

None of the Air Force's operational career fields can concentrate on a single focused career path for all of its members. Specialized tasks and different missions force career fields to diverge. This research contends that lower degrees of divergence, caused by reduced barriers to changing career paths, should lead to the creation of cohesive and operationally-oriented *domain*-minded cultures. Divergent career paths within a domain also lead to subcultures; the presence and successful management of subcultures indicates the transition from early growth to midlife organizational maturity. Divergence is present

between the combat air forces (CAF) and mobility air forces (MAF) career paths in the air domain, and between the space and missile career paths in the space domain. The degree of career path divergence differs for both air and space, but each approach contributes to shaping a *domain*-minded culture.

While all pilots are part of the air-minded culture, the two diverse missions of CAF and MAF led to the emergence of distinct subcultures in the air domain. Pilots must overcome lengthy training barriers in order to change career paths to a weapon system in the other subculture. Within the distinct subcultures, CAF and MAF pilots develop a tighter cohesion and a focused operational orientation for performing their specific combat or support missions. Combat aviators 'kill people and break things,' and mobility aviators ensure people and supplies get to the fight. The clear distinction between the subcultures and the barriers to changing paths allows for limited cross-flow in the air domain. This limited cross-flow has led to greater divergence within the career field, as well as more cohesiveness and a stronger operational orientation within the subcultures than for the overall air-minded culture.

In the space domain, space and missile operators face fewer barriers to changing career paths. Due to considerable Air Force needs, a majority of officers in the space domain begin their careers serving on combat missile crews. As space and missile officers move up in rank, the service has fewer positions for missileers, so many transition to space operations jobs. The only barrier to changing paths is completing an IQT course for the specialty which they are entering. There are few opportunities for field grade officers to transition back into the missile aspect of the career field, which creates a one-way cross-flow from missiles to space. The space and missile subcultures are therefore less distinct since many members of the space-minded culture have served in both tracks at some point in their careers. The lower degree of divergence contributed to an overall cohesive culture in which a majority of its members function in both the support and operational roles of the domain.

The cyberspace operations career field is currently split between the A-shred officers who perform the exploit, attack, and defend missions and the B-shred officers who perform the traditional support missions. At this time, no barriers exist for the A-shred network warriors to switch back and forth within the specialty throughout their

careers. Those officers assigned to the B-shred must demonstrate expertise and complete Undergraduate Network Warfare training in order to fill A-shred positions. Since 90 percent of the career field members hold the B-shred, and the service designates less than 10 percent of cyberspace operator billets as A-shred, a potentially large pool of cyberspace officers could vie for very limited A-shred job opportunities. These circumstances create a prospective two-way cross-flow for the A-shred cyberspace operators and very limited or no cross-flow for the B-shreds. Given that less than 10 percent of the career field earns the A-shred designation, the potential exists for one very distinct network warrior subculture to emerge within the Air Force cyberspace domain. This is drastically different than the 70 percent of the space and missile operators that complete assignments in the missileer warrior subculture of the space domain.

Air Force leaders can manage career path divergence in these early stages of the cyber-minded culture's development. They can leave things as they currently are, or increase the number of A-shred qualified cyberspace operators in the specialty. Maintaining the status quo would keep training costs down, as fewer cyber operators would attend the formal training required to earn the A-shred designation. However, this option would also keep a very small percentage of the career field operating in the network warrior subculture. Increasing the number of A-shred qualified operators would create a larger pool of candidates for positions in either career path and thereby encourage a greater two-way cross-flow between these tracks. This approach would lead to more 17D officers performing both the warrior and support aspects of the cyberspace mission and could increase overall cohesiveness among members of the cyber domain. In addition, more Air Force cyberspace operators would get to experience the operational flavor of the exploit, attack, and defend cyberspace missions, ultimately increasing the operational orientation of the career field. The cultural benefits associated with increasing the pool of A-shred qualified cyberspace operators far outweighs the increased training costs the service would incur by sending more 17D officers through Undergraduate Network Warfare Training. Air Force cyberspace leaders should consider this option for managing the 17D career path's divergence to foster greater cohesion and a stronger operational-orientation in its maturing cyber-minded culture.

Conclusion

This chapter compared and contrasted the three variables identified by this research as contributing to cohesive, operationally-oriented, and mature *domain*-minded cultures. The Air Force seems to be using some aspects of these variables to shape cyber-mindedness in the same manner that it fashioned air- and space-mindedness, while it has taken a different approach with regard to other aspects of the variables. This comparative analysis, moreover, provides guidance in how to shape the emerging culture in the cyberspace domain. Building a desired cyber-minded culture would strengthen another sphere of influence in which the Air Force contests adversaries; it should afford yet another means to put the enemy in an unpleasant situation and compel him to do our will.[7]

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[7] Carl von Clausewitz, *On War,* 75.

<div align="center">**Conclusion**</div>

So far, other countries have lacked the sophistication and will to do much damage to the US use of cyberspace. But since participation in and dependence on cyberspace is growing, the odds of consequential conflict, and thus hostile conquest, must certainly be rising.

<div align="right">Martin C. Libicki
Conquest in Cyberspace</div>

Introduction

This research explores how the Air Force can shape a cohesive, operationally-oriented, and mature cyber-minded culture. In support of this effort, this conclusion chapter makes recommendations to USAF cyberspace leaders, highlights the limitations of the research, and offers recommendations for future research. This research and these recommendations derive from studying the emergence of cultures in the Air Force's air and space operating domains.

Recommendations for Air Force Cyberspace Leaders

Air Force cyberspace leaders consist of anyone in a position to shape the emerging cyber-minded culture. From the initial recognition of cyberspace as an operating environment, the Air Force's most senior leaders frequently voiced their support. This advocacy has led to the creation of the cyber numbered air force (NAF) and multiple information operations wings, groups, and squadrons. The standing up of these organizations demonstrates a general acceptance of cyberspace as an independent domain of operations. That independence indicates that a cohesive and operationally-oriented cyber-minded culture has the opportunity to emerge. Senior leaders have provided the advocacy for the newly born cyber culture to pass into the early growth stage of Schein's organizational culture model. Leaders within the career field should now focus on the active mentorship of the career field's young officers. In addition to being mentors themselves, cyberspace leaders must actively cultivate more mentors to develop the career field. Mentors are critical to a culture because they pass on their knowledge and experiences to the next generation. Chapter 3 identifies several potential mentors for the cyber-minded culture based on the positions they currently hold. Senior

cyberspace leaders should identify additional mentors and clearly communicate expectations for them. One of them will likely become the next Billy Mitchell or Bernard Schriever of the cyberspace domain.

The Air Force should continue to rely upon technical degree requirements for those entering the cyberspace career field as the community establishes a common language. The communications career field lacked these accession requirements, so nearly 50 percent of those who transitioned into the new cyberspace operations officer specialty in 2010 did not meet the new career field's technical entrance criteria. Cyberspace leaders should strictly enforce this undergraduate degree requirement for the career field; it will help to foster cohesiveness more rapidly within its emerging cyber-minded culture by increasing the commonality among its young cyber officer corps.

The formal training aspect of this variable remains in its formative stage, but the Undergraduate Cyberspace Training model appears to be of appropriate duration and intensity for shaping an operationally-oriented culture. Cyberspace leaders should persistently assess the training to ensure it is achieving its desired effect. They should also encourage continuing education in the cyberspace domain since these programs seem very effective and well-timed within officers' careers to keep them up-to-date on the latest developments within this highly technical domain.

Each of the career fields responsible for operations in the three domains has diverged over time as members specialize and take on different responsibilities. The Air Force has set up the cyberspace operator career field with divergence between the operational and support missions. A small group of network warriors are qualified for positions in either cyber career path. The larger group of cyber support officers are only qualified for positions designated as B-shred. With such a small group of individuals qualified for two-way career cross-flow, a well-defined subculture could emerge among the officers assigned to the 17DXA specialty code responsible for the network exploitation, attack, and defend missions. As a method to lower the barriers between 17D career paths, cyberspace leaders should send more officers through Undergraduate Network Warfare Training. By creating a larger pool of A-shred trained cyberspace operators, the service could foster greater cohesiveness and a stronger operational

orientation in the career field, and it could diminish the perception that a small and elite group within the career field is responsible for the operational mission.

Limitations

A primary limitation in completing this research was the fact that cyberspace is a newly recognized military operating domain. The cyber-minded culture is still forming, and while this may be the optimal time to shape and influence the culture, it is also too early to tell whether the operational cyberspace domain will be more similar to air or space. These, however, are not the only domains in which the US military operates. This research only explored the three variables identified as influencing culture for the three Air Force operating domains. Different conclusions and recommendations may have evolved from researching the impact of the variables in the sea and land operating domains of the other military services. Finally, this research was based on a snapshot view of the cyberspace operations career field rather than a study of its growth and maturity over a longer period of time to assess its characteristics. Its analysis and recommendations derive from historical comparisons of longer duration to the air- and space-minded cultures.

Recommendations for Future Research

Future research into the cultures of military operating domains could prove valuable in understanding how to mold cohesive, operationally-oriented, *domain*-minded cultures. This thesis offers three recommendations for future research: consider additional variables, consider additional domains, and utilize a more quantitative approach.

This research explored three variables and how those variables influenced the Air Force's *domain*-minded cultures. Several additional variables might also contribute to a better understanding of how to shape culture with regard to military operating environments. Previous research by this author used an amalgamation of organizational culture resources to identify 13 factors useful in evaluating organizational cultures. They are: communication, team orientation, trust, conflict, rewards and recognition, motivation, participation, leadership support, learning, innovation, adaptability, tolerance

for risk, and an existing strong and positive culture.[1] Some, or all, of these factors analyzed in the context of the air, space, and cyberspace domains may provide useful insight for how cohesive, operationally-oriented, and mature *domain*-minded cultures emerge in each. The cultural evaluation factors of communication, trust, and leadership were the most relevant in that research, and those same factors should also be relevant for evaluating the emergence of a *domain*-minded culture.

This research delved into the air, space, and cyberspace domains as they exist in the United States Air Force. Investigation of the US Army and Marine Corps land domain, and the US Navy's sea domain could contribute significantly to understanding variables which influence the emergence of cultures in military operating domains. In addition, other military services exploit the air, space and cyberspace domains against our adversaries. Comparing and contrasting those domains as they occur in other branches of the military may contribute to a better 'joint' understanding and facilitate the interaction of all the services in these domains.

Finally, the qualitative nature of this research is another limitation. Surveys collecting quantitative data are time consuming but may provide the opportunity for valuable statistical analysis of the air-, space-, and cyber-minded cultures, especially as they develop and change over time. Future researchers may want to survey substantial numbers of officers functioning in each of the domains with respect to the variables from this research and the cultural evaluation factors identified above. A statistical analysis of the data collected from those surveys may impart a more accurate depiction of the cultures as they exist, and longitudinal studies would help researchers understand the continual evolution of various cultures.

Summary

Since the Air Force declared its mission to *fly, fight* and *win*...in air, space and cyberspace, it is critical to understand how all three domains contribute to the military instrument of power. Part of that awareness is recognizing the role of culture, how it

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[1] 1Lt. Jeffrey A. Phillips. *Incorporating Organizational Culture into a Decision Framework for Identifying and Selecting Knowledge Management Projects.* Air Force Institute of Technology Thesis, Wright-Patterson AFB, OH, March 2003, pg. 21.

emerges, and how to shape it in each domain. Cyberspace is the newest of these operating environments and, as such, Air Force leaders currently have the opportunity to build a thriving cyber-minded culture for the service. This research defined cyber-mindedness as the capacity to protect the nation and its global interests through understanding and maintaining the ability to conduct global, regional, and tactical operations through cyberspace. This definition highlights the need for an operationally-oriented culture; in addition, a cohesive officer corps functioning in the domain should enhance the ability of the service to dominate in this military arena. In an effort to accomplish these goals, this thesis addressed the following question: How can the USAF use its existing air-minded and space-minded cultures as templates to create a cohesive, operationally-oriented, and mature cyber-minded culture and engender cyber-mindedness in the new 17D cyber-officer career field?

　　　　To better understand the cyber-minded culture, this research investigated three variables: advocacy and mentorship, education and training, and divergent career paths. All play a factor in shaping *domain*-minded cultures. The air and space military operating domains have existed for 100+ years and 50+ years respectively. Cultures in these domains emerged and formed throughout their history. Over the course of time, the cultures experienced many changes, and even endured what Schein would characterize as 'destruction and rebirth,' but they aid an historical analysis for defining culture in the newest operating domain…cyberspace.[2] Chapter 1 explored the air domain and the evolution of the air-minded culture with respect to the three variables. Chapter 2 was a similar analysis of the space domain and the space-minded culture. Chapter 3 elucidated the current state of the cyberspace domain and recognized the importance of shaping the emerging cyber-minded culture. Chapter 4 offered a comparison and contrast of each variable with respect to each domain and analyzed the similarities and differences with an eye to strengthening the emerging cyber-minded culture.

　　　　The goal of this research is to offer recommendations to the Chief of Warfighting Integration and Chief Information Officer (SAF/CIO-A6) and other Air Force cyberspace leaders on how to shape a cyber-minded culture and, in turn, engender cyber-mindedness

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[2] An example of the 'destruction and rebirth' of a culture is the merger of the separate space and missile career fields in 1994.

in the new career field and the new operating domain.   Indicators, such as shared norms among members of the career field, career cyberspace operators holding key leadership positions, and recognition of the domain as an independent sphere of operational influence may offer evidence that a cyber-minded culture is emerging. Cyberspace leaders who implement the recommendations offered in this research can contribute to '*Engendering Cyber-mindedness in the USAF Cyber Officer Corps.*'

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